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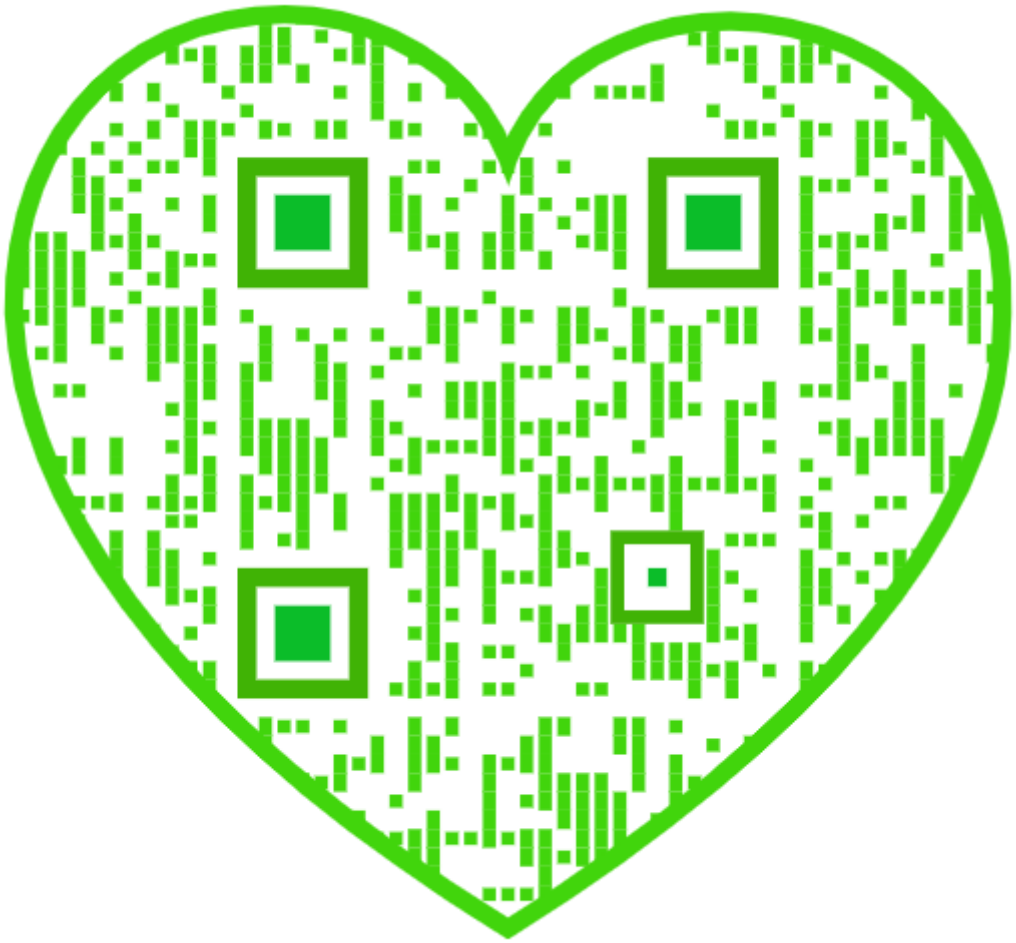

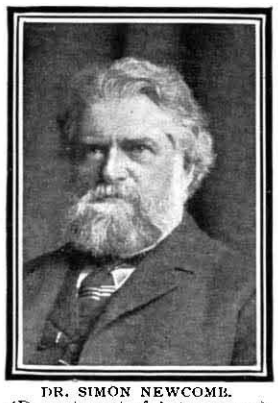

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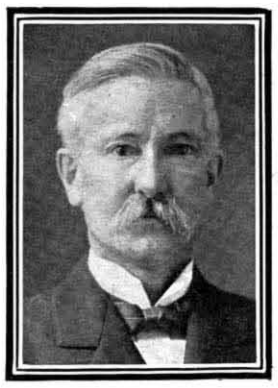

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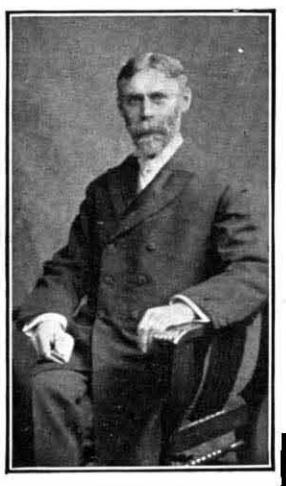

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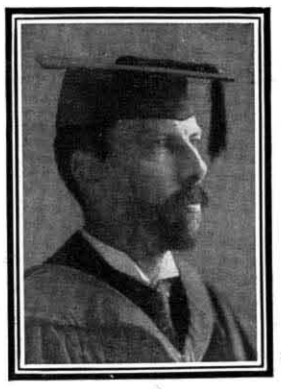

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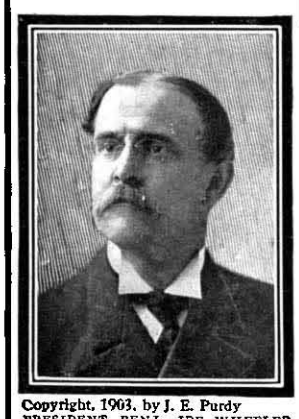

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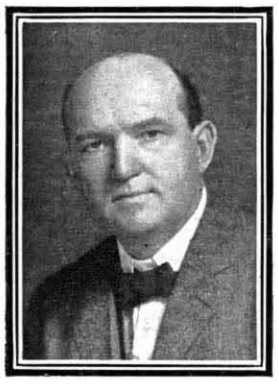

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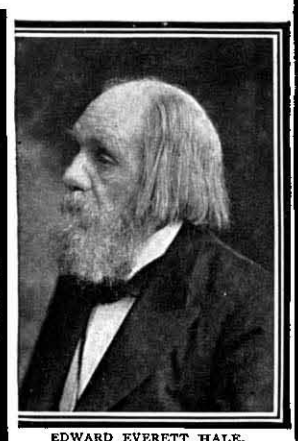

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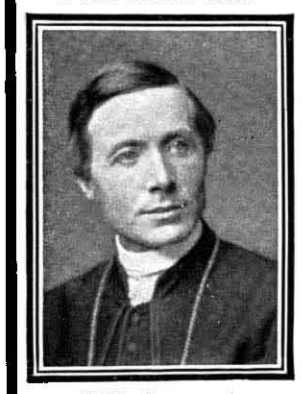

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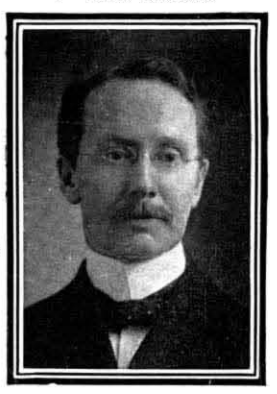

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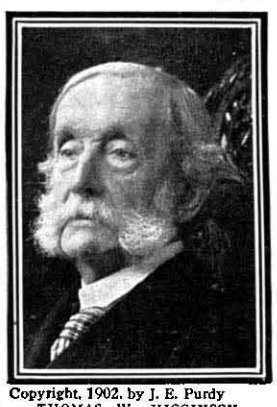

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THE INCOMPARABLE WHITE

THE CAR FOR SERVICE

A SEASON OF WHITE TRIUMPHS

Above is shown the final scene in one of the White triumphs of the year—the winning of the Hower Trophy. This was the only individual prize offered in connection with the 1907 Glidden Tour and was won by the White Steam Runabout after a faultless trip of 2080 miles, the longest journey ever made on schedule and the longest without an adjustment or repair, of which there is official record. The White Steamer, by the way, was the only make represented in the Glidden tour by three or more cars which was not penalized.

In hill-climbing, no other car has been able to offer any serious competition to the White. The White scored the fastest time, by wide margins, in the only three American hill-climbs in which it was entered—namely, at Wilkes-Barre, at Cleveland and at Witter, California.

In the great race-meet at Santa Rosa, California, a stripped Model "G" made a mile in 1:02, 10 miles in 12:54 and 25 miles in 29:07. These times were made in competition and are the fastest made by any car on the track this season.

The White Steamer won the three "desirability contests" held in England during the past season. The first of these was the London Town Carriage Competition, the object of which was to determine "the relative advantages of different types of self-propelled vehicles for town use." The White won this contest against a field of 22 of the leading foreign cars. Secondly, the White won the greatest English hill-climb, held at South Harting. This was primarily an efficiency contest wherein first award was made to the White because it developed a greater percentage of its assigned horse-power than did any other car, ***the rating assigned to the White being 50 horse-power.*** The third of the "desirability contests" won by the White was the dust competition held on the new Brooklands race track. The results of this contest officially confirmed the general opinion that the White raises less dust than any other car.

So numerous, in fact, have been the White victories of the season that a brief summary of them entirely fills the new White Bulletin No. 14, a copy of which we will be glad to send on request. White Bulletin No. 13, describing the mammoth factory in which the White Steam Cars are built, will also be found of interest.

Before choosing your automobile, read White Bulletins Nos. 13 and 14

THE WHITE COMPANY

Cleveland, Ohio

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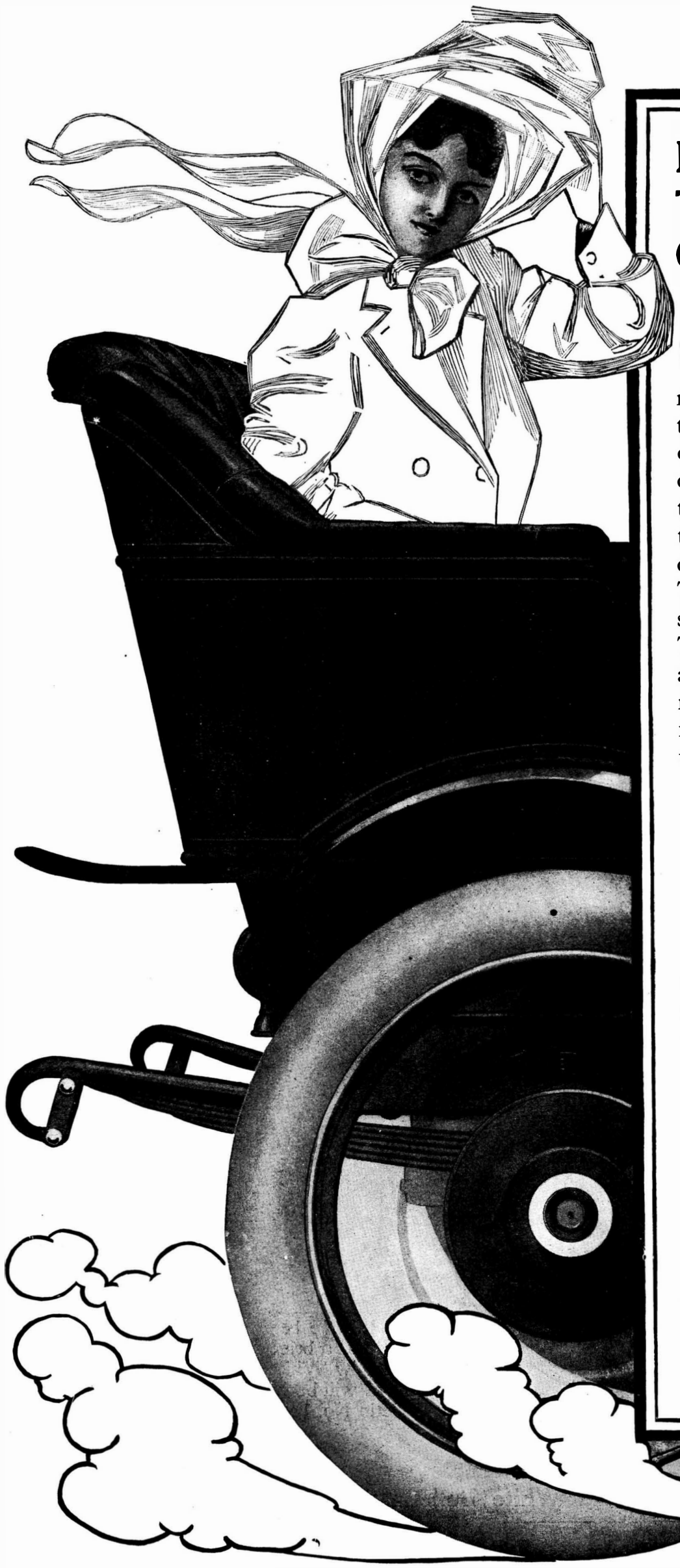

MORGAN & WRIGHT Tires Actually Reduce the Cost of Car Maintenance

¶ GOOD TIRES have much to do with the economy as well as the comfort of motoring. They have considerably more to do with the protecting of other parts of the car than many motorists give them credit for. Good tires can and do save their cost, as well as earn it in the pleasure they give. Hence there is more significance in the fact that Morgan & Wright Tires are possessed of unusual reserve strength than may appear on the surface. This extra strength not only fortifies against costly repair bills, but it does much toward saving the car from unnecessary strain or injury, and thereby actually minimizes the cost of maintenance.

MORGAN & WRIGHT TIRES ARE GOOD TIRES

¶ We have dozens of letters similar to the following one, which is from a Pennsylvania motorist:

"By the use of your tires the cost of operating my car has been practically cut in half, to say nothing of the satisfaction of having a tire equipment that gives no trouble under the hardest service. I am particularly pleased with them after having used three other leading makes."

¶ Any motorist who wants it can have the same kind of service by using the same kind of tires.

MORGAN & WRIGHT, Detroit

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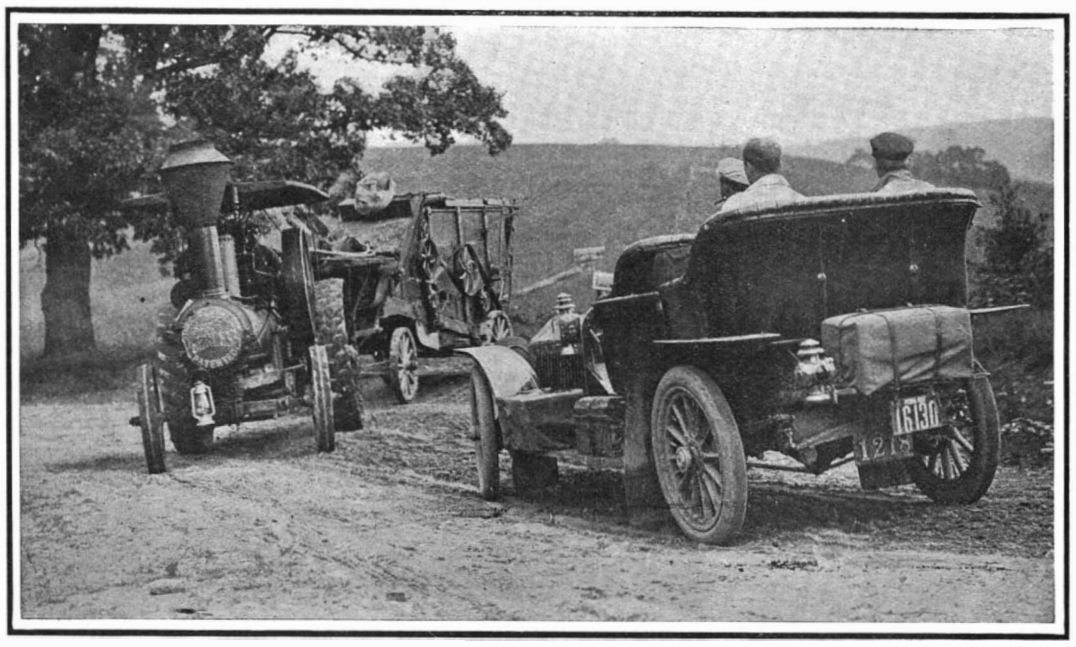
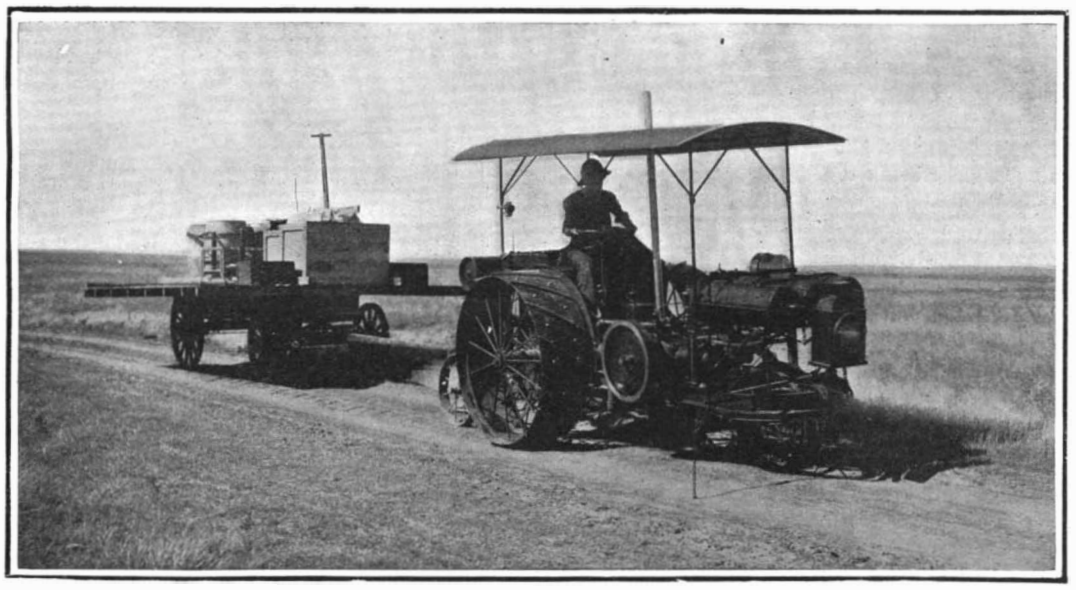
The 18-Horse-Power White Steam Army Ambulance.

The photograph was taken while the machine was making a 300-mile trip from Washington, D. C., to Gretna, Pa., loaded with a ton of medical supplies. An average speed of about 17 miles per hour was maintained.



"When Greek Meets Greek." A Scene in the Middle West.

A "Peerless Six" is shown encountering a steam traction engine as it emerges from a field drawing a thresher. The steam traction engine was the forerunner of the automobile in both England and America and many of these machines are used throughout the West to-day.



The Wysong Gasoline Autotractor, Which is Superseding the Steam Traction Engine in the West.

This machine is equipped with a 4-cylinder, 2-cycle scavenging engine of a novel type. On account of the light weight of the tractor it can be used on soft ground where it would be impossible for the heavier steam tractor to go.

A "Rapid" Gasoline Motor Ambulance.

This type chassis has a double-opposed cylinder motor of 24 horse-power, direct-connected to a two-speed planetary gear transmission which drives a countershaft by a chain. The final drive is by double side chains to the rear wheels.

Scene on Fifth Avenue at Forty-Second Street Since the New Automobile 'Buses Have Come Into Use.

These 'buses were built in America and mounted upon imported chassis of the De Dion type, fitted with 24-horse-power 4-cylinder motors. Despite the double rate of fare the new omnibuses are generally crowded.

NOVEL TYPES OF UTILITY MOTOR VEHICLES

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SCIENTIFIC AMERICAN

ESTABLISHED 1845

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NEW YORK, SATURDAY, NOVEMBER 9, 1907.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

SINGLE-PHASE ELECTRIC EQUIPMENT ON THE ERIE RAILROAD.

The year 1907 must ever be memorable in the history of the development of electric traction, because of the notable installations which have been made on three of the leading railroad systems of the United States. Early in the year we recorded the opening for regular service of the terminal line of the New York Central and Hudson River Railroad Company in this city. Six months later, the New Haven system put in partial operation the single-phase system on its four-track road from Woodlawn to Stamford; and in the middle of June, of the same summer, an important change from steam to electric traction was made on a 34-mile stretch of the Rochester division of the Erie Railroad. The same month, also, saw the inauguration of electric operation on forty-four miles of the West Shore steam railroad between Utica and Syracuse, the system used being the direct-current with the third rail, and the equipment being in general similar to that of the New York Central terminal lines, with the important exception that the multiple unit system is used throughout. The equipment of the New York Central and West Shore lines, as well as that of the New Haven system, have already been fully described in this journal. The Erie electrification is of the same general character as that of the New Haven road. A working pressure of 11,000 volts is used on the trolley line, the current being transmitted at the high pressure of 60,000 volts. The overhead construction is much simpler than that employed on the four tracks of the New Haven road. In the latter case, it will be remembered, each line is made up of two messenger wires with a trolley wire suspended below and between them, by means of rigid triangles. The messenger or suspending wire is of seven strands, and 7/16 of an inch in diameter, and is made of "extra high strength steel." The trolley wire is suspended from this at 10-foot intervals by means of a series of 5/8-inch iron hanger rods. This wire is, of course, much more flexible than that in use on the New Haven system; and for that reason we should expect to see fewer disarrangements than are liable to occur where the trolley wires are stretched under high tension, and because of the rigid connection of the latter to the triangles are liable to rather serious hammer blows from the contact shoe. The current is taken from the trolley wire by means of pantograph trolleys, and passes through transformers of 200-kilowatt capacity, before it is led to the four 100-horse-power, single-phase railway motors with which the cars are equipped. The control system is of the electro-pneumatic type of the Westinghouse Company, by whom the whole of this work has been done. The above-described equipments serve to operate single cars, with one stop per mile over the entire road, at an average schedule speed of twenty-four miles per hour; or to haul one trailer, making stops about 2½ miles apart, at the same speed.

THE AUTOMOBILE AT THE RECENT SHOWS.

Nothing at the two fall automobile shows — that in the Grand Central Palace from October 24 to 31 and the other in Madison Square Garden from November 2 to 9—indicates so surely that the automobile has reached the final stage of its development, as the fact that novelties of type are conspicuous by their absence. Outside of the buggy-type machine and the two-engine automobile, there is very little among the exhibits which can be called a radical departure from the all-prevailing type.

Compared with last year, there is a marked increase in the number of runabouts exhibited, this, indeed, being the fashionable machine of the season. The runabout owes its popularity largely to its smart appearance and the absence of that heavy and more or less cumbersome appearance which characterizes the limousine top or the hood-covered tonneau. Most of those exhibited have 4-cylinder engines of from 30 to 40 horse-power, although there are also a number of 6-cylinder models.

There are not many changes in the chassis from last year. The pressed-steel, riveted, frame is used almost universally; but a decided improvement in appearance and ease of riding has been secured by the more general adoption of the platform spring suspension, in which a transverse spring is carried at the rear, in place of the old spring hangers, and attached at its ends to the two half-elliptical side springs by universal joints. A few manufacturers are making the frame with a drop to clear the axles, the object of this being to place the frame and gear lower down, and keep the whole driving shaft in as near a straight line as possible. The arrangement has the further advantage of lowering the center of gravity of the car.

The car bodies are, almost without exception, exceedingly handsome examples of the coach-builder's art, and there is noticeable a gratifying tendency toward severity and simplicity of outline and detail, the more or less elaborate curvature of earlier cars giving place to straight lines. There is evidence, also, of better taste in the matter of color; although a few fanciful designs are shown which stand out in rather unfavorable contrast with the other machines.

As the engine is the all-important element in a car, so it was the first to be brought to its final type. There is but little change of consequence to be noticed from last year's models. The most significant feature is the growing popularity of the six-cylinder engine. This is attributable to the fact that the increased cost and trouble of maintenance which were predicted, have not materialized, and the public have found that the theoretical advantages of less vibration and a more constant torque abundantly justify the extra cost of this type. For hill climbing and the general emergencies of the road, the six has proved itself to be decidedly superior to the four-cylinder type. As a rule, magneto ignition is used, with the jump spark as an auxiliary; ball bearings have advanced in favor, and a few makers are using the non-adjustable silent type. Fans are now driven by gears instead of by the old belt drive. A few makers are doing away with the pump and substituting thermo-siphon circulation, which has been used for some years on the foreign Renault car. Two-cycle engines are exhibited in both shows. One maker has three and four-cylinder models in addition to the two-cylinder runabout of last year. On the other hand, the older maker of this type has returned from the use of four to the use of two vertical cylinders.

The most popular form of transmission appears to be the three and four-speed, sliding gear, selective type. Some machines with four-speed transmission have the direct drive on the third speed, the fourth being used for sprints and the direct for all ordinary running. Friction disk transmission is exhibited on a few makes. It owes its success largely to the perseverance of one or two western firms; and their lead is now being followed by several other manufacturers. An improvement on the original type, which is shown on a six-cylinder, 75-horse-power car, consists of a planetary gear transmission, in which conical rollers, made of compressed paper, take the place of the usual spur and internal gear. This transmission has two speeds, and its merit lies in the fact that the friction drive is in use only on the low speed and the reverse. This car has no gears in the transmission, the only gears being those of the bevel gear drive at the rear axle. The friction disk transmission is used extensively in the increasingly popular buggy type of machine, in which differential gears are dispensed with and double ratchets are fitted to the ends of the countershaft for forward and backward motion. A few cars carry a transmission connected to the differential at the rear axle. This arrangement has proved very successful during the past two or three years on one of the leading American cars; it is also in limited use in France. The advantages claimed are that it permits of a long straight shaft from engine to rear axle, and reduces the angularity, and, therefore, the loss of power.

There are few parts of the automobile in which such diversity can be found as in the clutch. There are three main types which share in popular favor. Chief among them is the well-established cone clutch, which has the advantage of extreme simplicity. Its reputation has been acquired in many years of service, and when it is made of sufficient size to match the power of the engine, it gives most satisfactory results. The other devices have been designed to secure large frictional resistance with small size and weight, and chief among them is the floating-disk or ring clutch, in which, by making use of several rings and disks, it is possible to secure a large frictional surface in a small space and with relatively little weight. The rings vary both as to their diameter and number, one car using as many as nineteen disks, and another disks that are as much as 14 inches in diameter. The expanding and contracting band types also meet with much favor, since they can be compactly and accessibly mounted in the flywheel, and also since they hold well and can be readily adjusted.

Not very much that is novel is exhibited by the tire manufacturers, although there has been an all-round advance in quality. A non-puncturable, self-healing tube, exhibited at last year's show, has been tested with promising results, and is again on exhibition this year. There is also shown a filled tire, containing a special composition of glue, glycerine, etc. It is said to have been quite successful and has been welcomed on those machines whose service exposes them to severe tire troubles. Some half-dozen types of quick-detachable rims seem to have all given satisfactory results. This device has proved to be a great advance over the old style clincher tire.

Unquestionably one of the most novel cars at the Automobile Club of America's show in the Grand Central Palace was a large electric touring car fitted with the new Edison storage battery, the card on which announced that the batteries were good for a continuous run of 100 miles. Another car which excited considerable interest was provided with a two-engine motor, there being two entirely separate 24-horse-power, four-cylinder engines, arranged side by side, parallel with the longitudinal axis of the machine, and connected by transverse chains to the transmission shaft. The makers claim that such a car, with two 30-horse-power engines, exhibits a saving of weight of some 5 per cent over a 60-horse-power car with a single engine. The principal merit of the car is that, in case of one engine breaking down, the other remains to bring the car home. The advantages of twin engines have long been recognized for marine service, and the safeguard against absolute breakdown which the division of the power insures is as valuable on an automobile as on a steamship. The other distinct novelty is the buggy-type automobile, of which no less than twenty different makes are on the market. These cars use a friction disk, or other form of friction drive, and are very simple and economical in construction. The wheels and bodies are essentially those of the standard type of horse buggy, the former being of large diameter and shod with solid tires. It is claimed that the cost of such tires, including maintenance, is not more than one-fourth as much as that of the pneumatic tire. They are capable of a speed of from 15 to 20 miles an hour and their low cost of from $500 to $850 is rendering them exceedingly popular with people who are satisfied with a moderate speed and who cannot afford the heavier cost of a large machine. They are used extensively by physicians, and are becoming popular among the farmers and residents of smaller towns and villages.

The low-cost car is also represented by several small runabouts, one manufacturer offering a single-cylinder engine car at a cost of $500, while a double-opposed-cylinder or four-cylinder runabout can be had for from $650 to $700. Although there seems to be no relative gain in the number of steam cars, the two companies which exhibit are doing a large business. The well known advantages of good hill-climbing ability, simplicity of operation, and reliability, have served to maintain the steam car in popular favor.

A NEW FRENCH AEROPLANE RECORD.

Saturday, the 26th of October, M. Henri Farman's new aeroplane, which we illustrated in the SCIENTIFIC AMERICAN of that date, accomplished a record-breaking flight of 771 meters (2,529.52 feet) above the drill ground of Issy les Molineaux, near Paris. The flight was made in 53 seconds, or at an average speed of 32.54 miles an hour. Earlier in the day M. Farman made a flight of 363 meters (1,190.94 feet) in 30 seconds, which was equivalent to a speed of 27.06 miles per hour.

The flight of nearly half a mile is by far the longest which has ever been made in Europe with an aeroplane, and it marks a long stride forward in the navigation of the air by a heavier-than-air machine, especially when the fact is borne in mind that it came as the culmination of a long series of flights made during a number of days without any accident or damage to the machine. On October 15, M. Farman flew 935 feet; on the 25th, 984 feet, and on the 29th, the distances given above.

When this machine is compared with that of the sculptor Delagrange, which earlier in the year made some short but successful flights of considerable promise, the Farman aeroplane is found to have a somewhat greater supporting surface (697½ square feet as against 645.84). Like the former machine, M. Farman's consists of two long superposed surfaces 33.45 feet in length by 6.56 feet wide, followed, at a distance of about 15 feet, by two other superposed surfaces 19.68 feet long by 6.56 feet wide. The same type of double horizontal rudder is fitted at the front, and the

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forward pair of planes also carry the 50-horse-power motor and the 6.56-foot propeller, the pitch of which is 3.6 feet. The weight lifted per horse-power with this machine ranges from 22 to 25 pounds, supposing that the motor developed its full power. The probabilities are, however, that the lift per horse-power was somewhat greater. The amount lifted per square foot of supporting surface was about 1¾ pounds, which is considerably less than most modern French aeroplanes are capable of lifting. Notwithstanding the large supporting surface, the speed of the machine was as great, and probably greater than that of any of its foreign predecessors. The fact that it exhibited good stability goes to show that this type of machine is one which apparently has a future.

RESCUING OUR ROADS.

BY GEORGE ETHELBERT WALSH.

Foreigners continue to anathematize American roads after a tour over them, especially if the trip takes them through parts of the Middle West and the South or in the rocky regions of New England. But much as we recognize the justice of this criticism, we look with pardonable pride upon the obverse side of the shield. In the past five years we have redeemed upward of five thousand miles of highways from the wayward habit of going to the bad, rescued some six thousand more from sloughs and swamps of mud and water, and mapped out plans for improving many other thousands so they will in time become at least passable. We have inaugurated new systems of road building, framed new methods of taxation for highway improvement, and interested nearly every progressive community in the work of developing better highways.

The ideal road is still in the stage of experimental evolution. Consult road engineers and experts, and one will inform you that Telford and MacAdam laid down the principles of road construction that cannot be properly departed from, and another will tell you that to attempt to adhere to such principles would ruin half the counties of a dozen States. One set of engineers places drainage as the chief aim in road building, but another will point to the fact that one-third of our roads cross arid or semi-arid regions, where drainage is not a factor of any considerable value. Others have made extensive studies of French and English roads, and are positive that we must duplicate these foreign highways here if we expect to secure ideal results.

But happily the consensus of engineering opinion is crystallizing around the very simple proposition that road making is largely a local matter, depending upon the topography, climate, geological formation, and requirements of any community. The roads in the United States must be developed according to special standards, and not according to those set in other countries. The sentiment of the country is in favor of good roads, but not for French or English roads or necessarily for Telford or MacAdam roads. It is for good roads, worked out by engineers who can best appreciate the needs, conditions, and materials of any particular section. We have many typical illustrations of how certain sections have already solved the road problem according to special needs. In California there are the best types of oiled roads, which answer for the dusty highways of that State better than anything yet attempted. But what road making from the conservative point of view of a Telford or MacAdam principle!

The roadbed of dirt and sand is first plowed, harrowed, rolled, and graded, until there is a layer of finely pulverized soil ten to twelve inches deep over the surface, but no signs of crushed or broken stone, no material whatever—except a little sand on top—such as is used for the foundation of the Telford or MacAdam roads. Then when this graded road has dried and settled, crude petroleum or asphalt residuums are spread over the surface. The oil is heated from 175 to 300 deg., and spread over the road at this very high temperature. From one hundred to three hundred barrels of oil are used on each mile of road, eighteen feet wide, at an estimated cost of $15 to $20 per mile. Coarse sand or gravel is spread over the oil, to increase the absorption and to protect passing vehicles. Sometimes a second coating of oil is put on within a few weeks. This method of road building in California costs about one and a half cents per square foot, while asphalt costs fifteen cents, and powdered granite about five cents. California's road problem is the suppression of dust and the modification of the hot glare on bright sand. The oiled roads become indurated and resilient with oil, so that the dust is permanently laid and the bright sand modified to dark brown. There are nearly 1,500 miles of these oiled roads in California, and with the exception of staining white dresses or shoes coming in contact with the oil, they make the best possible highways for hot, sandy, dusty regions, with hardly a single drawback. The surface is not easily cut up with wagon tires, for the oiled surface does not soften like asphalt pavement, and the rubber tires of motor cars are not injured by the oil, as first supposed.

California has thus made a long stride toward attaining the ideal road for the sandy strip of country reaching from the mountains to the coast. Other States with similar soil and climate have entered upon the work of building oiled roads. Texas has obtained some excellent results in this direction, and wherever oil is cheap the work has assumed considerable progress. Crude oil ranges in price in California from 70 to 80 cents per barrel, but in many other States the cost of oil makes road building of this character a physical impossibility.

As a direct result of successful experiments with oil for roads in California—and in Oran, Africa, and several towns of Algiers where aloe and massot oil were used—road builders took up the question of employing tar, either alone or in connection with oil for road surfacing. In France a mixture of tar and oil was tried in 1900, and by 1901 such good effects were obtained with various tar mixtures, that many miles of roads were surfaced with them. The French engineers pursued the subject with intelligent perseverance, and they secured some ideal roads for traveling. The tar is applied hot at about 210 deg., and only in dry weather. After the tar is applied, a sprinkling of sand is made over the surface to harden the mixture and to prevent slipping of horses and vehicles. By the addition of heavy oils, the tar is hardened more quickly, and the road thrown open to general traffic. All dust and mud are eliminated by the tarring process, and the roadbed itself is kept from injury by heavy traffic. The waterproof character of the tar surface keeps the water from entering the roadbed, and thus eliminates one of the most destructive agencies of highways.

In England tar is also used quite extensively for the maintenance of the surface of the roads, and in this country it is also a well-recognized practice. One of the first applications of tar to the surface was made at Jackson, Tenn. The surfacing lasted about seven or eight months. In Montclair, N. J., a mixture of tar and screenings was tried in 1904 on a steep grade, and for a year practically no wear or tear was noticeable on the road. Since then a number of other roads in that town have been similarly treated at a cost of about 17 cents per square foot, including the cracked stone and screenings. The tarring itself cost only about five to six cents per square foot. In several other New Jersey towns and on Long Island, roads are now being treated with tarred surface for eliminating dust and mud and for the protection of the road itself.

The difference between the method of tarring the surface of roads in France and this country is in the use of sand or screenings. In France they merely sprinkle sand on the tar after it has cooled a day or two, but in this country cracked stones or screenings are either mixed with the tar or sprinkled upon the surface, with the purpose of incorporating them as much as possible with the tar. The French roads are excellent, and form a dry, dustless surface, but they do not last as long as the American roads of equal excellence. The tar and screenings, when properly mixed together, form a sort of cushion, which greatly reduces abrasion.

The use of tar in territories where there are ample rainfalls is far superior to oil, for the latter then forms an emulsion with the water, which does great damage to vehicles and clothes. It makes the surface mushy, and resprinkling is necessary at intervals. But in dry, hot, arid regions the oil is superior to tar, and accomplishes the object of laying the dust and forming a smooth compact surface better. It is consequently a question of climate and topographical conditions which must determine the use of materials and methods in any part of the country.

But probably the great problem of road building in this country is confined more to the Mississippi Valley. In this vast region road-building materials are scarce and expensive. The use of oil or tar for surfacing would prove of little value, unless the roadbed itself could first be built up of proper material. There is no good gravel, no slates, shales, or silicates available for the roads of this region, but there is plenty of rich land and heavy soil. Drainage is naturally poor, and road building becomes an engineering problem of great difficulty.

In our New England and Eastern States stone and gravel are abundant, and road building is chiefly a problem of proper construction of beds with some of the nearby stones. Drainage is first essential, but this can be obtained by elevating the bed of the road sufficiently, and constructing ditches, culverts, and bridges at proper points. It is a work which any competent engineer can plan and carry to perfection. The principles of the Telford and MacAdam roads here come into vital use. Roads once properly built of the right material will, if repairs are made systematically and scientifically, last indefinitely. At the recent International Engineering Congress in England, an engineer of that country who had four hundred miles of road under his jurisdiction, reported that he had only to rebuild two or three miles a year. The vital point which he wished to emphasize in this report was that if proper methods of repair and maintenance are early adopted, the roads can be made to last indefinitely, and practically do not require rebuilding oftener than once in a decade or two.

The automobile has had a somewhat paradoxical effect upon our roads. It has been a tremendous factor in stimulating the construction of better roads, and a good deal of money has flowed from the treasuries of the motor associations into road building. But the automobile has increased the dust problem of many localities, and it has made the treatment of macadam roads on the surface with tar or oil mixtures to lay the dust essential. In Massachusetts the rescue of many of the highways simply means an application of some surface mixture to lay the dust of finely-powdered rocks and gravel. Several large appropriations have been made by the Highway Commission to test the various patent mixtures for solving the dust trouble, and the United States government is conducting some experiments near Wayland, Mass., for similar purposes. These dust layers consist for the most part of tar and oil in different proportions, and the very fact that so much attention is given to them by manufacturers and the public indicates a healthy condition of affairs, and it must in the end contribute toward road improvement.

But the larger aspect of the road problem in this country includes the construction of better highways in those great middle sections of our country where neither sand, gravel, stone, nor shales can be had without great cost. Where natural road-making material is abundant, the engineer has no very great problem to solve; and after good roads are once built, the rest depends upon good maintenance and the further improvement by dressing the surface with dust-laying materials of tar or oil. Good gravel, granite, and hard stones make the best materials for roads; but limestones, slates, shales, and the silicates are used in many sections with fair success. The soft limestones make fairly good foundations, but they do not last so long as harder stones, and the shales are affected by frost, so that they require renewal oftener. Some of the silicates, however, prove exceedingly durable, and it has been found profitable and economical to transport some of these two and three hundred miles for road building.

In the great Mississippi Valley there is practically no good road-making material at hand, and whatever is used must be transported great distances at considerable expense. In Illinois, Alabama, Kansas, Iowa, and other middle central States the road problem is acute to-day. Occasionally gravel beds are found which yield fair road-making material, and in the hands of the engineer good stretches of highways have been made at no great cost. The drainage on these rich farming sections is almost as bad as it could be, and this increases the cost and trouble of the work. Traveling through these States in an automobile makes one conscious of the great road problems facing our richest agricultural regions. In vain have local and national engineers sought to devise some means of making roads in these States without importing stones, gravel, and other building material. But apparently the roads must be built at great expense through the employment of materials transported from more favored sections. Transportation thus becomes the most vital factor in road making of the Mississippi Valley and of many of the Southern States. If good roads are to be had there, the materials must be brought by the railroads, and co-operation between the steam lines and local highway commissions must be secured.

No hard and fast rules of highway building could be laid down for this great central region, although the best granite or gravel would pay the best in the end, for it costs no more to transport it than the cheaper shales and softer limestones. The question of durability and cost of maintenance would have to be seriously considered. In the experiments made by the government and local commissions, good roads of broken stones, such as granite, flint, and silicates, prove more economical than cheaper materials, and many of the middle western towns and cities have miles of excellent highways built at only thirty to forty per cent more than the cost of similar roads in the East, which, with proper care, will last for many decades.

Good roads in the Mississippi Valley pay better than almost anywhere else in the country, owing to the vivid contrast between them and the natural poor roads. The increase in valuation of property along the line of macadam roads in this section has been all the way from fifty to sixty per cent, and many new, thriving towns are to-day making strenuous efforts to attract settlers and investors through improving roads. It has proved an economical success to increase road taxation in order to secure higher real estate values. Road construction across the middle of our continent at the present rate of development should within another decade completely revolutionize conditions; and a trip across from ocean to ocean by automobile should prove a popular pleasure instead of a tiresome struggle with muddy, dusty, and heavy stretches of roads.

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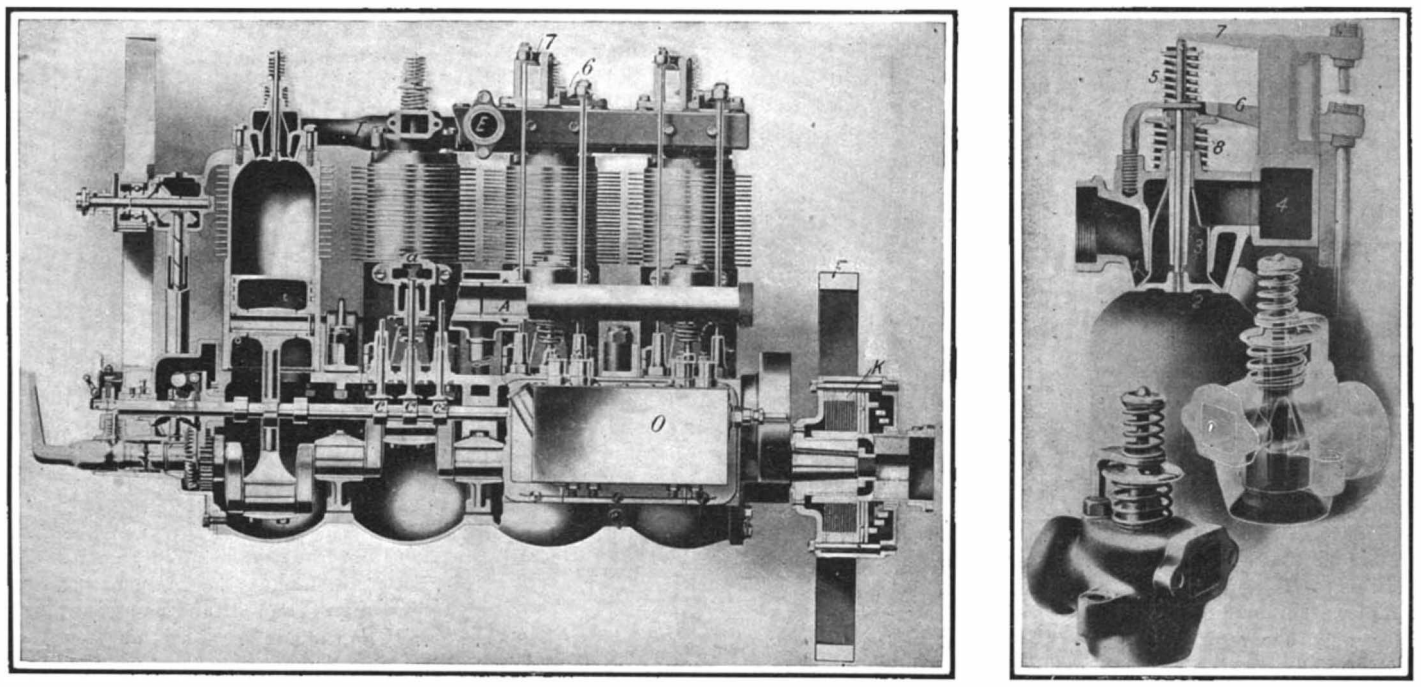
ENGINES

LATEST IMPROVEMENTS IN THE FRANKLIN AIR-COOLED ENGINE.

From the time when it made its first appearance before the American public, the Franklin engine has always been noted for its light weight, powerfulness, and especially for its air-cooling feature. When this little engine was first brought out over five years ago, it consisted of four cylinders of 3¼ inches bore and stroke, and rated at 7 horse-power. The next year, by refinements in construction, the horse-power was raised to 10; and subsequently, by adding an auxiliary exhaust, and thus disposing of the burnt gases faster and more effectively than is done in any other type of engine, the horse-power was raised to 12. For 1908, by the addition of a cylinder with a dome head and having a single concentric valve, the horse-power of this same sized engine has increased to 16, or, in other words, it is now over 100 per cent greater than it was at the start five years ago. Thus, in a half decade, Mr. John Wilkinson, the inventor of this engine and car, has not only been able to make a success of a type of engine which the French gave up in disgust, but he has also succeeded in obtaining results in the line of durability and economy which has not been duplicated abroad by the French or by any other nation.

Aside from the fact that it is placed in a cylinder head which is shaped correctly for the highest efficiency, the new concentric valve is interesting in itself as regards its construction and method of operation. Something of this sort was tried several years ago upon the Lanchester air-cooled engine made in England, but the valve used in that engine was constructed differently, and was subsequently abandoned. The new Franklin arrangement consists of a valve within a valve. The outer, or exhaust valve, is merely a shell having a long hollow stem through which passes the stem of the inlet valve, 2. This latter valve seats against the inner surface of the shell, that is, against the part, 1, which forms the seat of the exhaust valve. Both valve stems are provided with washers and springs, as can readily be seen from a glance at

(*Continued on page 346.*)



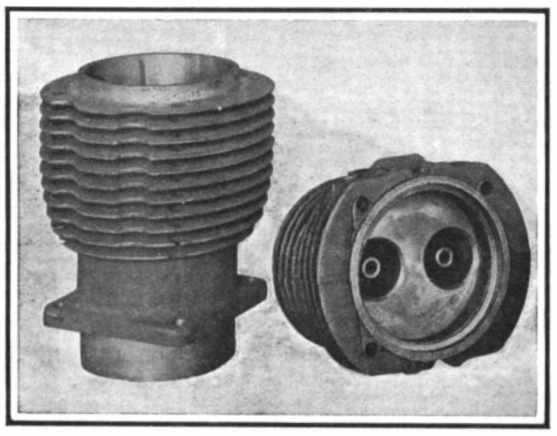
Partial Cross-Section of the Improved Franklin Air-Cooled Engine and Its Novel Valves.

One cylinder is shown in cross-section, while the auxiliary exhaust valve is shown in cross-section in the next one. The fan is shown driven by bevel gears. 1. Seat of exhaust valve. 2. Inlet valve. 3. Interior of exhaust valve. 4. Inlet port. 5 and 8. Valve springs. 6 and 7. Valve operating levers.

IMPROVEMENTS IN THE MARMON AIR-COOLED MOTOR.

One of the most successful American air-cooled motors is that constructed by the firm of Nordyke & Marmon, of Indianapolis, Ind. For several years past the Marmon 4-cylinder V, or 90-degree motor, has been one of the standard American makes. This year the company produced a larger motor having eight cylinders in rows of four set at an angle of 90 degrees, but for 1908 this huge model has been dropped, and only the 4-cylinder, air-cooled V motor and an ordinary 4-cylinder vertical motor with water-cooled cylinders will be built. A decided improvement in the new air-cooled motor is a detachable head, which is shown in the illustration. This head is fitted to the cylinder with a ground joint, and is held in place by four rods which bolt it to the crank case. Besides the usual radiating flanges, the head contains the inlet and exhaust valves and ports, so that there are no extra valve cages to be released before the valves can be removed. Access to the valves is greatly simplified and made easy for the chauffeur, and in case it is necessary to grind these valves, the whole head can be instantly removed and the valves ground without the danger of getting any emery into the cylinder.

Furthermore, by this construction, it is made easy for the chauffeur to scrape out the cylinders and remove any carbon deposit from the cylinder or the cylinder head. This is something that it is sometimes necessary to do, especially with an air-cooled motor, where carbon deposits in the cylinder or the head are apt to cause premature explosions Beyond bringing out of a 4-cylinder vertical water-cooled motor, the Marmon engines have not been changed any during the past year. They still retain the same system of force-feed lubrication by forcing oil through a hollow crank shaft to all the bearings. This system, as well as the car, was fully described and illustrated in our Automobile issue two years ago, and we refer our readers to that issue for a complete description of the machine as it stands to-day.



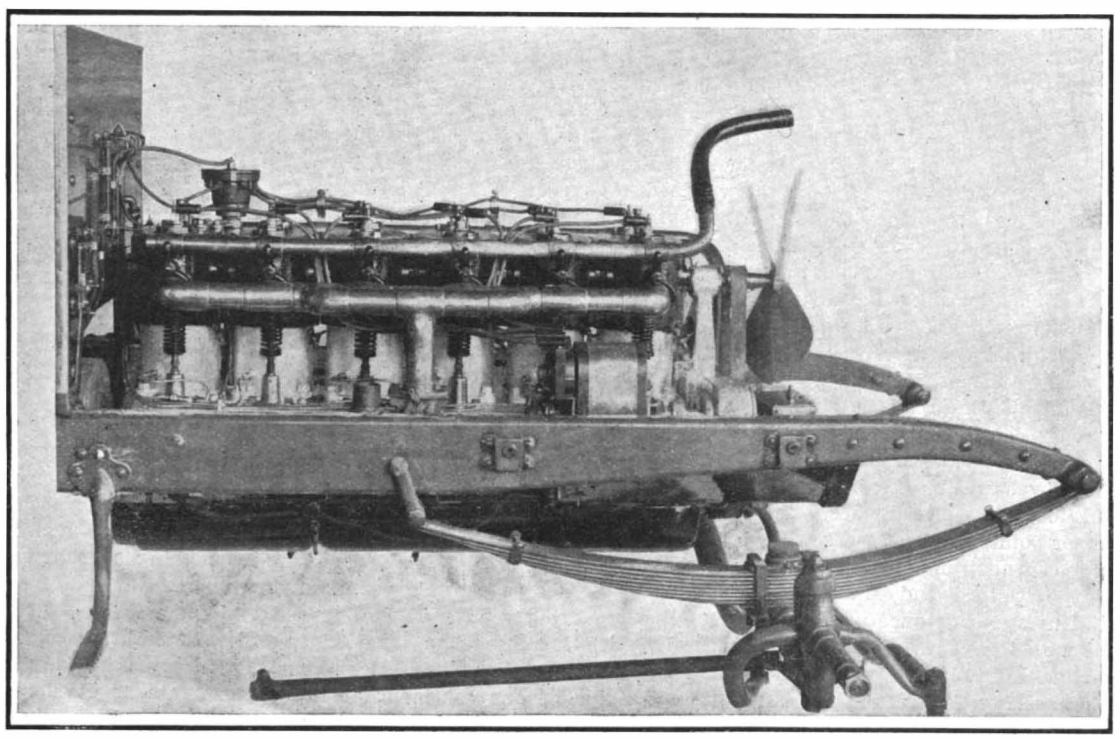
Separate Cylinder and Head of the Marmon Engine.

The valves are located in the head, which is securely bolted to the cylinder.

THE NATIONAL 6-CYLINDER ENGINE.

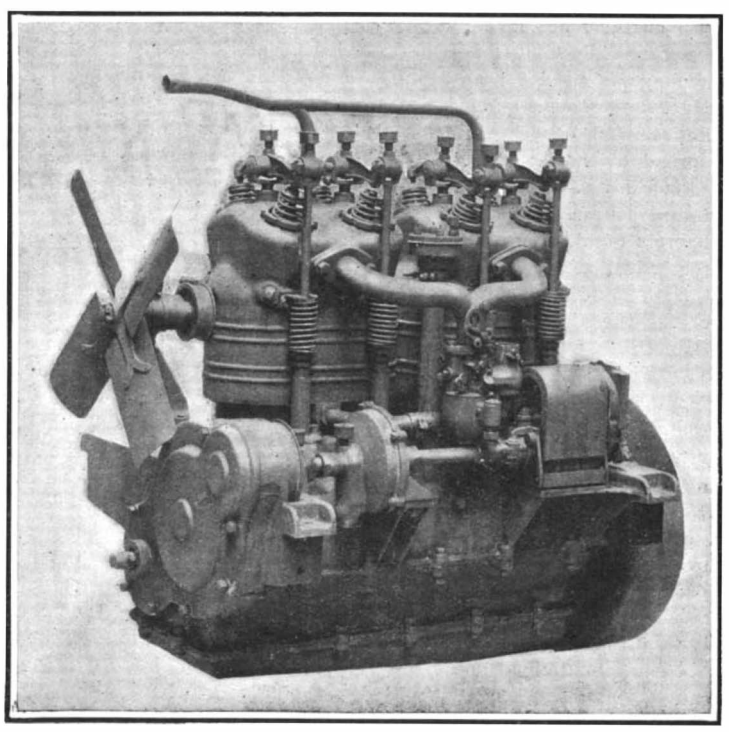
The National Company was one of the very first concerns in this country to adopt the 6-cylinder engine for its touring cars. The new 1908 6-cylinder motor, which we illustrate, is one of the most compact engines of this type on the market. It has individual cylinders of 5 inches bore and stroke. The improvements in this engine have been such as to do away with what little vibration there sometimes is with an engine of this type, and also to reduce the noise as much as possible. For accomplishing the latter purpose, large, wide-faced, spiral gears are used for driving the two cam shafts, and the shafts are mounted in Hess-Bright ball bearings of generous size. The cams are especially large, as are also the nickel-steel valves, which have a very small lift, and are thus practically noiseless. The valve lifters have large rollers at their lower ends. The inlet, exhaust, and water pipes have been increased considerably in size, but they are attached to the engine in the same way as heretofore, that is, by a common yoke, which holds both the water

(*Continued on page 346.*)



Inlet Side of the 6-Cylinder National Engine.

This engine is a typical 6-cylinder of the separate cylinder type. The valves are in chambers on opposite sides of the heads. The high-tension magneto and the distributor for the single spark coil are plainly visible in the illustration, as are also the carbureter, fan, and oiler.



Inlet Side of the New 35-Horse-Power Stoddard-Dayton Engine.

The valves are located in water-jacketed valve chambers placed on top of the cylinders, which are fitted with corrugated copper water jackets. Each pair of valves is operated by a single rocker arm. Description of engine will be found on page 346.

SOME IMPROVED ENGINES OF 1908 CARS.

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THE HEWITT 8-CYLINDER 90-DEGREE MOTOR.

The Hewitt Motor Company will continue to manufacture, next year, the 8-cylinder V motor shown in our illustration, and will apply it to their touring car as heretofore. Mr. Edward R. Hewitt, the designer and builder of this motor, has done a great deal of experimenting with engines of this type, which is that used so largely in France for airships, aeroplanes, hydroplanes, and the like. He believes that this type of motor is far superior to the usual 4-cylinder, or even the 6-cylinder type, as it has in a still further degree the leading features of the latter, and yet does not take up any more space than does the former. As far as weight is concerned, the 6-cylinder motor is heavier than the 8-cylinder motor of the same power, and besides this it has a very long crankshaft, which is springy and difficult to make. The 8-cylinder V motor has the usual four-throw crankshaft that is used on engines of the 4-cylinder type. When the piston of one cylinder is half-way down on its working stroke, that of the opposite cylinder is just ready to begin on the working stroke, the result being that there is a practically constant torque. This motor can also be perfectly balanced, and hardly requires a flywheel. The range of speed is very great; so great, in fact, that when mounted on the car speeds of 3 to 70 miles can be had on the high gear. The ignition system consists of a high-tension magneto, with the addition of a battery and coil for the purpose of starting on the spark. The motor is lubricated by a gear-driven mechanical oiler, which forces the oil to every cylinder and every bearing. Splash lubrication is also used. The motor is fed from a single carbureter placed above and between the cylinders. The timer and distributor are located upon a vertical shaft at the forward end of the motor, as is also the mechanical oiler. A centrifugal water pump, gear-driven from the crankshaft, is placed at the forward end. The valves are all mechanically-operated, and are

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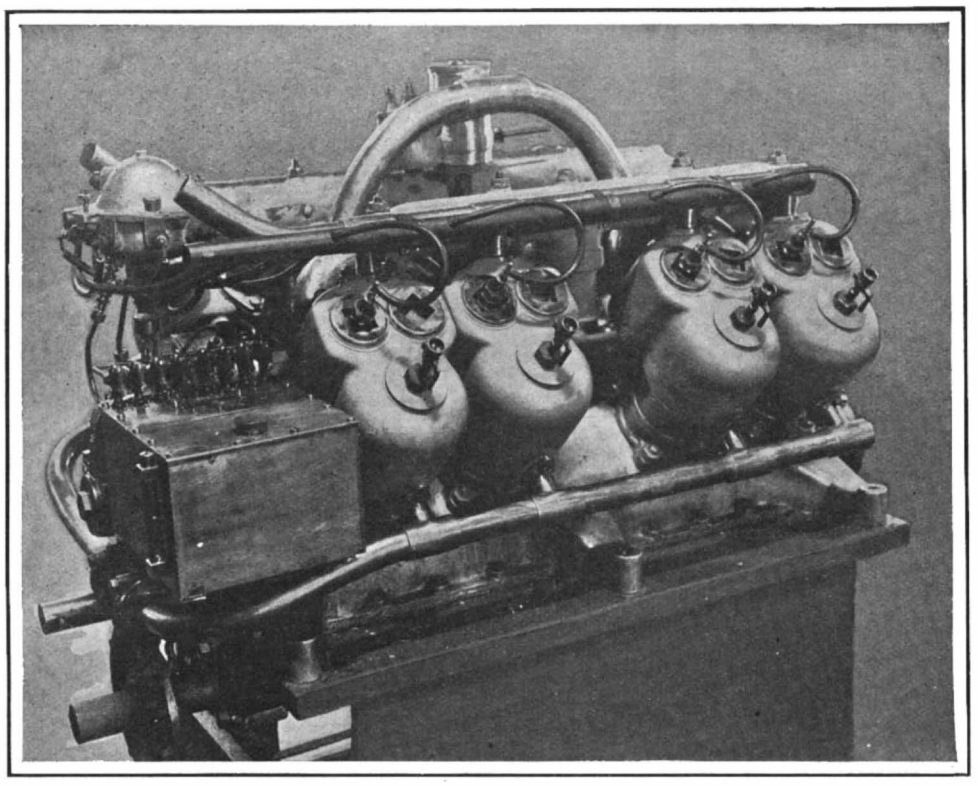

The Hewitt 8-Cylinder V Motor.

This is the only automobile motor of its kind constructed in America. It is of the same type as that used by Santos Dumont and other foreign experimenters on aeroplanes, hydroplanes, and dirigibles. The motor illustrated is much more substantial in construction, however, than those of its kind built abroad.

THE CARTER TWO-ENGINE CAR.

Probably the most novel automobile exhibited at the recent show in the Grand Central Palace was that in which two 4-cylinder air-cooled motors of 24 horse-power each formed the motive power of the car. The idea of a duplicate power plant came to Mr. Howard O. Carter, the inventor, one day when he was stranded many miles from home on account of a disabled engine; and that he has followed out this apparently somewhat freakish notion to a successful conclusion, can be seen from the accompanying illustration. The two engines are mounted side by side, and are connected, through cone clutches in the flywheels and by Morse silent chains, to a single three-speed transmission placed in the center of the car. Each engine, with all accessories, is entirely separate from its neighbor. The method of operation is as follows: One engine is started by cranking in the usual manner. The car is then run along on the one engine until a steep grade or bad piece of road is met with. Then the clutch of the other engine is engaged while the car is running slowly on the high speed. The second engine immediately starts, and with double the horse-power instantly available, the car can ascend the grade or traverse the bad road without dropping back to a lower gear. The main idea of the inventor, however, is the provision of a duplicate power plant, which is instantly available in case of a serious breakdown of the regular one. That this system does not make an abnormally heavy car can be seen from the fact that the

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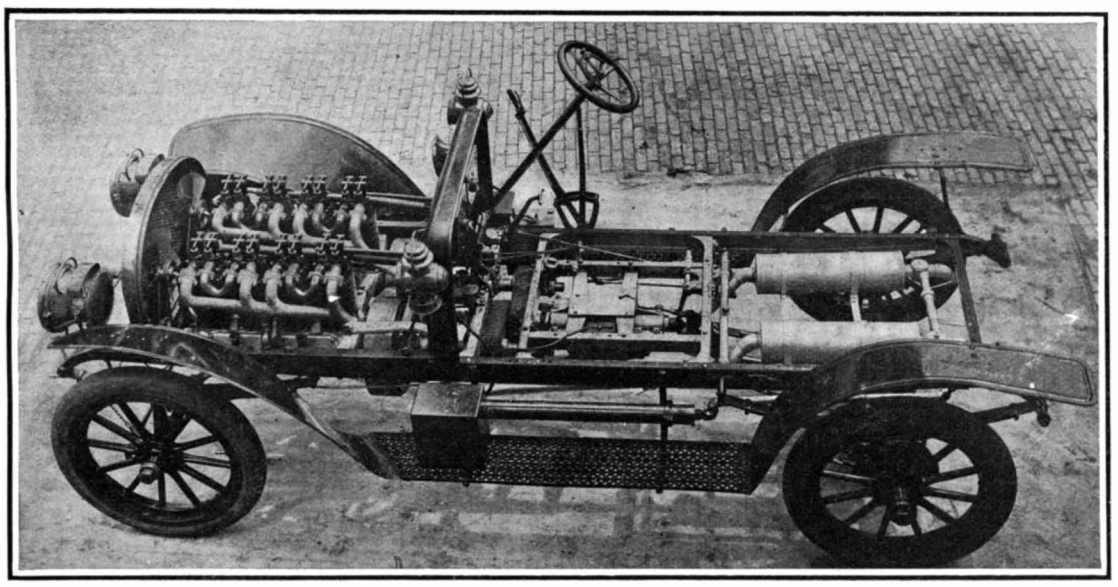
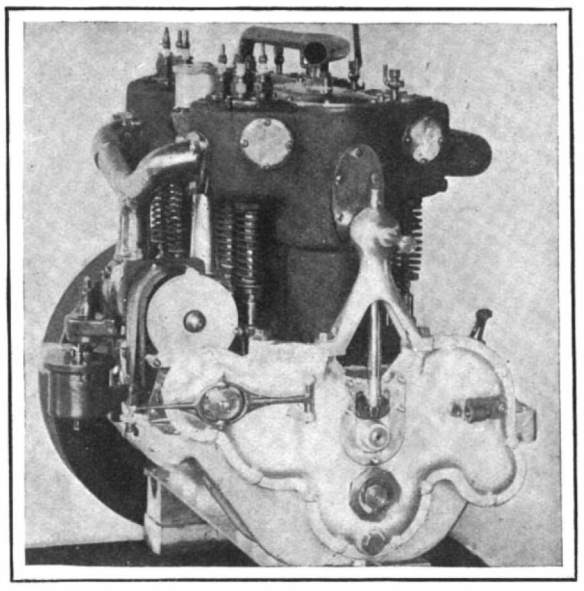


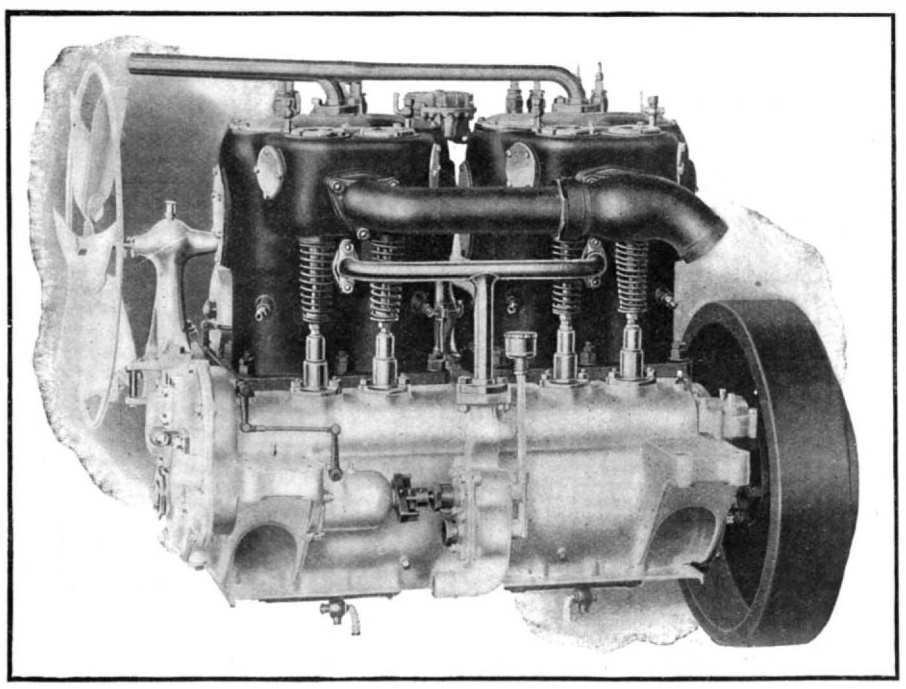
Chassis of the Carter Twin-Engine Car.

The inventor of this machine has adopted duplicate power plants mainly for the purpose of increasing the reliability of his car. The two engines are connected to the transmission through Morse silent chains.



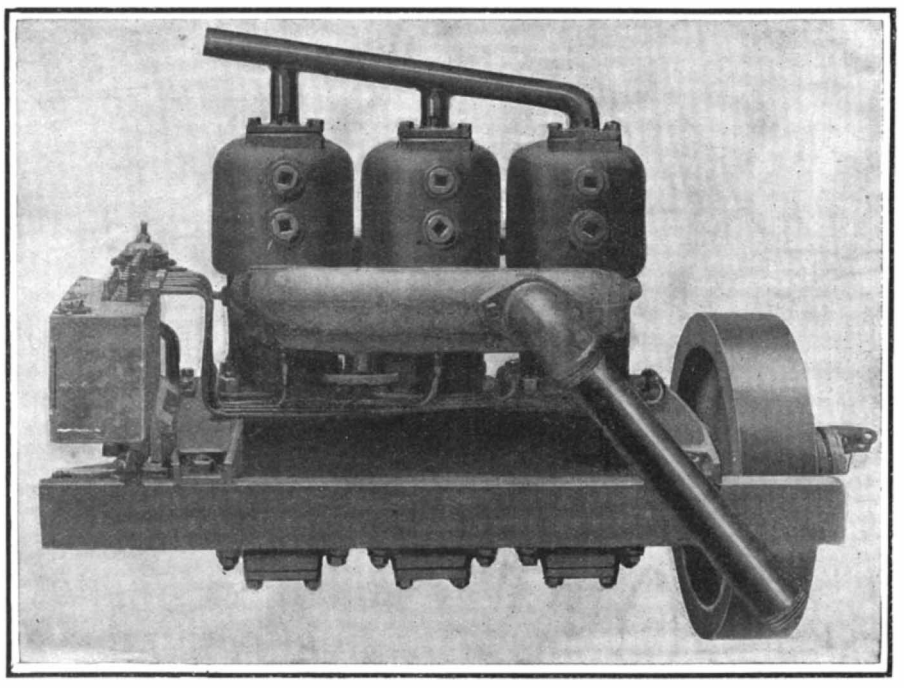
Front View of the Peerless Motor.

This picture shows the carbureter and magneto, as well as the lever for advancing armature of the latter.



Exhaust Side of the Peerless 30-Horse-Power, 4-Cylinder Motor.

Note the neat casings of the gears and governor. The latter is seen beside the crank case, its shaft being prolonged to drive the pump. The fan is driven by bevel gears. The commutator is seen on a vertical shaft between the cylinders, as are also the twin spark plugs in the head of each cylinder.



The 45-Horse-Power, Two-Cycle Engine of the Reliance Truck.

The simplicity of the two-cycle engine is apparent from this photograph. There are no valves, with their accompanying springs, push rods, and cams; while some engines of this type can also be reversed. The mechanical oiler is the only mechanism visible in the above illustration.

SOME IMPROVED ENGINES OF 1908 CARS.

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TRANSMISSIONS AND CHASSIS

THE HATFIELD BUGGY TYPE CHASSIS.

There are a large number of high-wheeled vehicles fitted with solid rubber tires, light opposed-cylinder motors, and planetary or friction-disk transmissions, now upon the market. One of the most interesting of these, as well as one of the simplest, is the Hatfield "Buggyabout," a plan view of the chassis of which we illustrate. As can be readily seen, the motive power consists of the double-opposed-cylinder, air-cooled motor of 12 horse-power, which drives, through a pair of friction disks, the transverse countershaft placed directly under the seat in the center of the machine. The disk on this countershaft can be slid to one side or the other of the disk on the motor crankshaft, thus securing the forward speeds and the reverse. Separate driving chains run from sprockets on the ends of this countershaft to the large sprockets, which are mounted on the rear wheels through a peculiar trussed-wire arrangement. To allow for the differential motion of the gear wheels at the countershaft, a patented type of double ratchet is provided in a drum on each end of this shaft. One set of these ratchets are used in going forward, and the other when the car is reversed.

The steering gear used on this car is very similar to that used on some of the first automobiles ever built in this country. The whole front axle is swung on a fifth wheel. Attached to this axle is a semicircle of angle iron upon which slides a chain. This chain is fastened to each end of the axle, and it passes around a horizontal sprocket mounted upon the vertical steering post. When the steering wheel is turned, the sprocket moves the chain and swings the entire front axle. A turnbuckle makes it possible to tighten the chain if necessary.

The friction disk is slid upon the countershaft by means of a lever placed beside the driver's seat, while pressure upon a pedal applies this disk to that on the flywheel and starts the car ahead. Brakes are located upon the countershaft, and are very powerful. They are applied by another pedal. A gasoline tank is located in the dashboard, and carries sufficient fuel for a run of 160 miles.

Another machine exhibited at the Grand Central Palace show, and which was very similar in construction to the Hatfield, was that made by the Schacht Manufacturing Company, of Cincinnati, Ohio. A water-cooled motor is used to propel this machine, however, and the gasoline tank is located in the back of the seat, while the dashboard consists of a radiator. The steering gear of the Schacht machine is of the ordinary automobile type, but with the differences mentioned, the car is quite similar to the machine shown above.

THE GEARLESS TWO-SPEED TRANSMISSION.

One of the most novel friction transmissions exhibited at the Automobile Club of America's show in the Grand Central Palace was that seen on the Gearless 6-cylinder touring cars. In this transmission the disadvantages of the usual form of friction disk arrangement have been done away with, and a gear of the planetary type having conical friction rollers in place of spur gears has taken its place. In this device there are no varying peripheral speeds of the friction surfaces at the point of contact, and consequently no

(*Continued on page 340.*)

THE POWER PLANT OF THE HOLSMAN CAR.

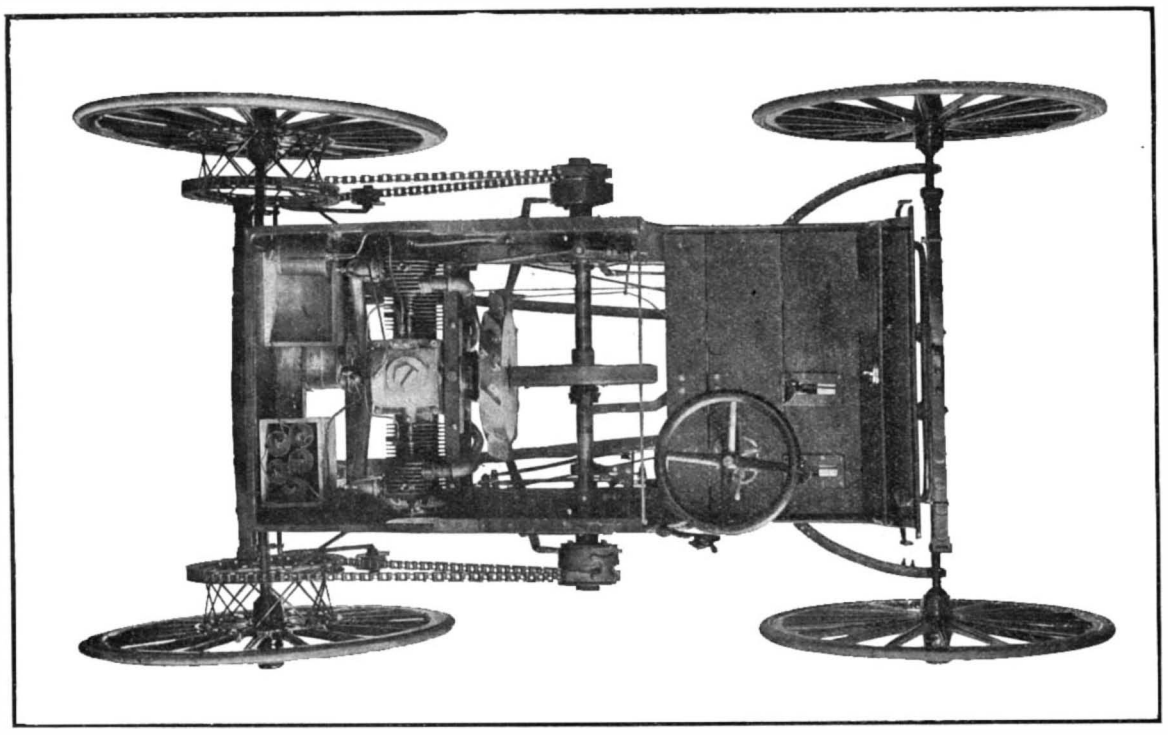
One of the first, and possibly the most successful, of the buggy type machines is that made by the Holsman Automobile Company, of Chicago. Our illustration shows the power plant used on this car, and its simplicity is apparent from a glance at the photograph. As can be readily seen, the engine is of the double-opposed-cylinder type, having two air-cooled cylinders with the usual cast flanges. The bore and

(*Continued on page 340.*)

A UNIQUE FORM OF TRANSMISSION GEAR.

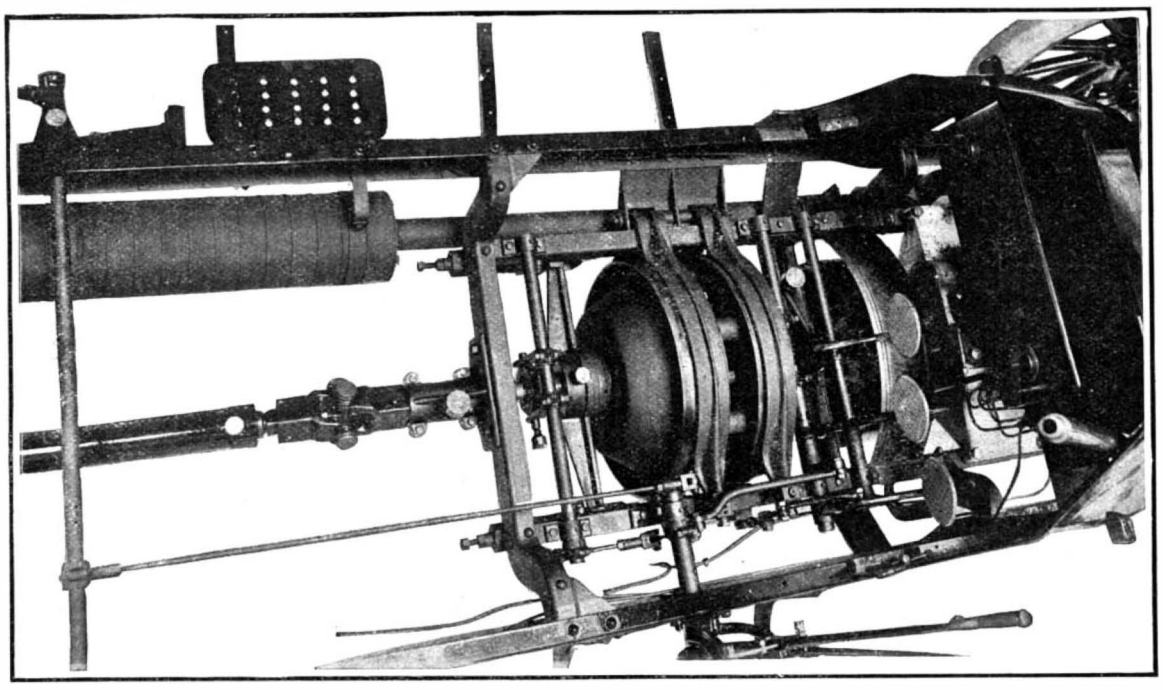
The transmission shown in the accompanying photograph is one of the simplest and neatest gears of its type that we have seen. In designing it, the inventor has done away with the usual type of sliding gear transmission in which the gears mesh from the side, and has made an arrangement that the gears can be put opposite the large gear placed upon the differential and can then be meshed face on.

As can be readily seen, there is a sliding member of



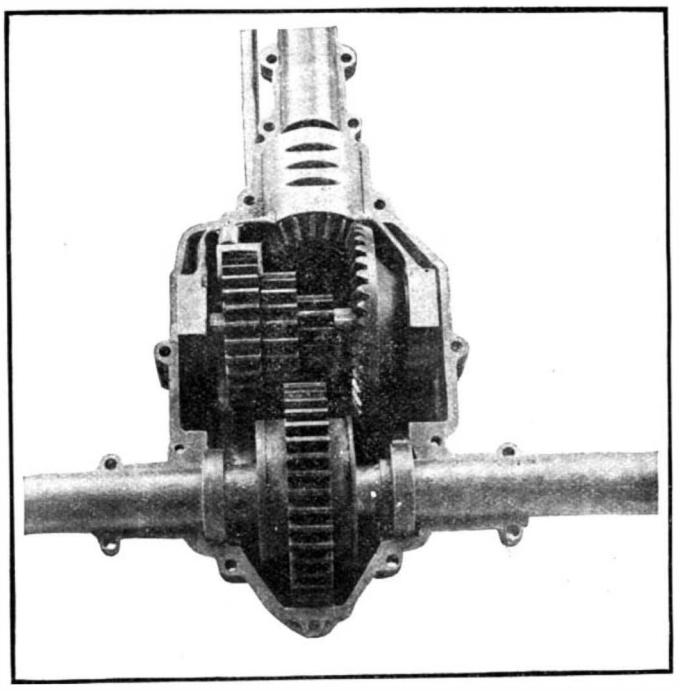
PLAN VIEW OF THE HATFIELD "BUGGYABOUT" CHASSIS.

The above is one type of chassis used with machines of this kind. The motor flywheel is faced to act as a friction disk. Another disk on a countershaft is slid opposite different points on the flywheel to produce the various speeds. Ratchet clutches on the end of the countershaft replace the differential. In steering, the whole front axle is swung on a fifth wheel.



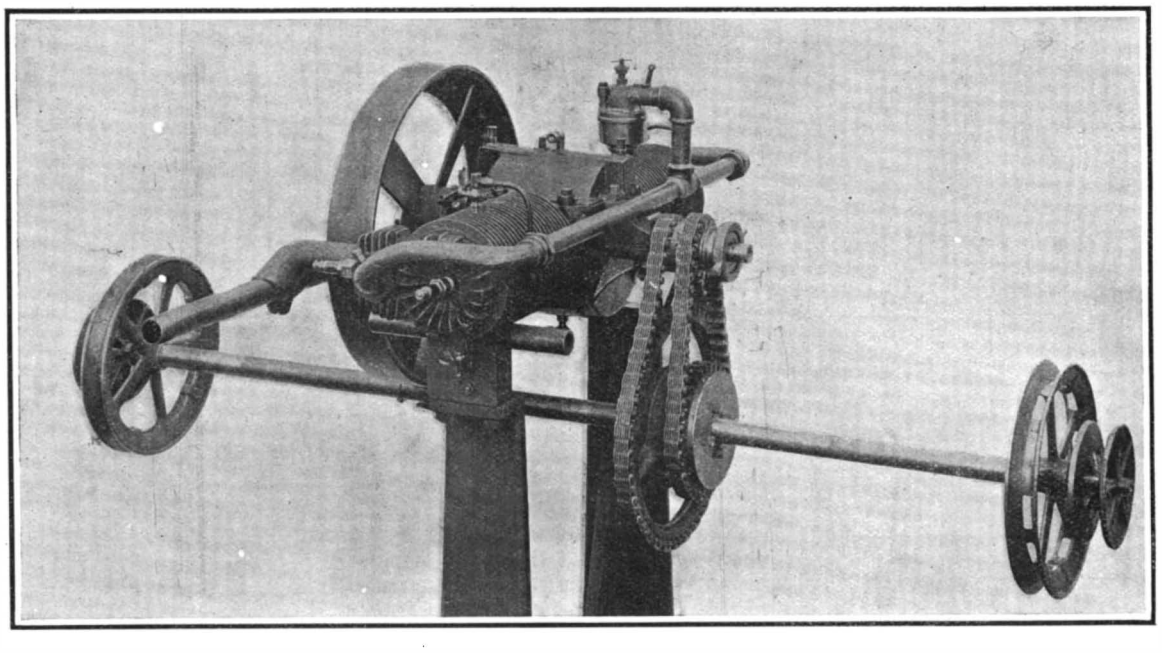
THE TWO-SPEED PLANETARY FRICTION ROLLER TRANSMISSION OF THE GEARLESS CAR.

This transmission is similar to the ordinary planetary gear type. Conical friction rollers take the place of the usual spur and internal gears. Two of these are visible between the two band brakes. The band brakes are applied by pedals, while the internal expanding ring clutch in the forward drum is operated by a hand lever.



THE CAMERON—A UNIQUE SLIDING GEAR TRANSMISSION.

The gears are first moved opposite the large gear on the differential and then meshed with it face on. To obtain the reverse, a wide intermediate pinion in the upper half of the gear case is dropped into mesh with the two large spur gears.



ENGINE AND TRANSMISSION OF THE HOLSMAN CARRIAGE-TYPE AUTOMOBILE.

This air-cooled engine has two opposed cylinders of four inches bore and stroke. It is connected to the countershaft by two Morse chains which produce the high or low speed. The large pulleys drive the rear wheels by patent chain cables. The reverse is obtained by pressing the small pulleys against the tires of the rear wheels. The engine has two spark plugs in each cylinder and fan-blades in the flywheel for cooling.

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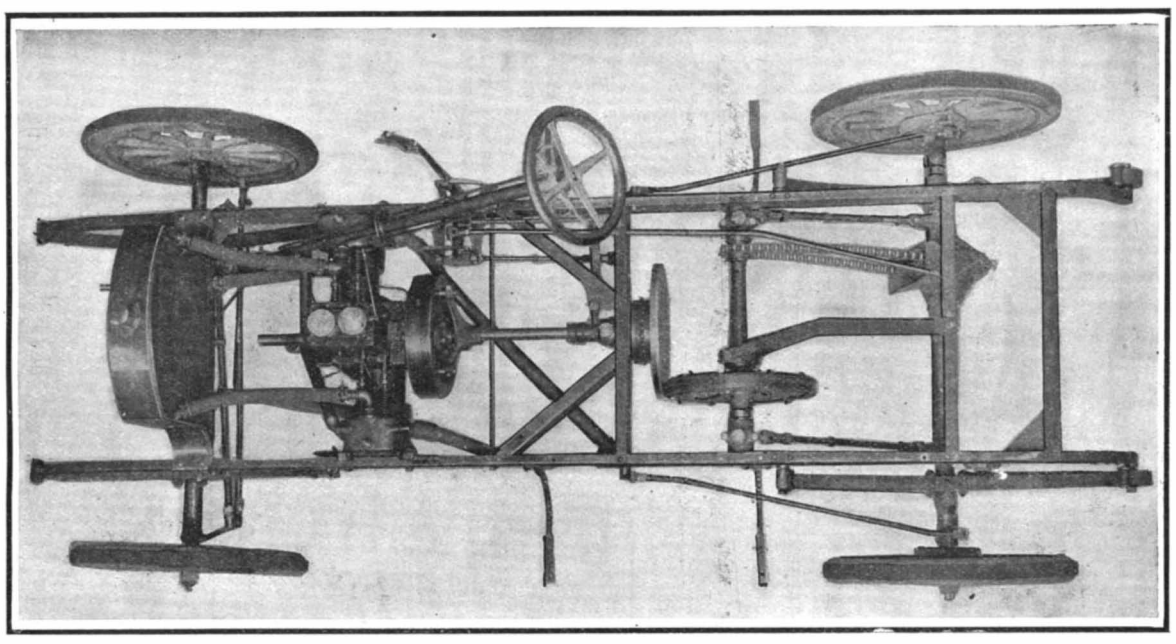
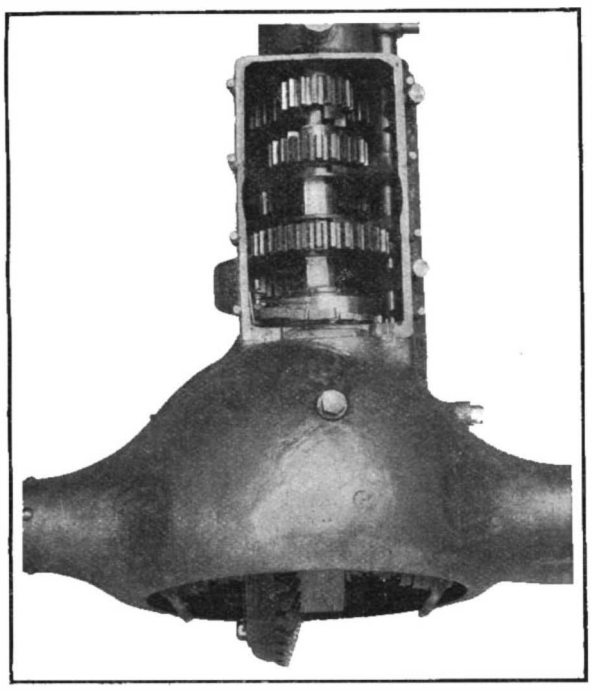


CHASSIS OF LAMBERT CAR, WITH FRICTION-DISK TRANSMISSION.

This is a typical double-opposed-cylinder car with friction-disk transmission. The drive is by a single chain to the live rear axle. The driving disk on the extension of the crankshaft is faced with aluminium and the periphery of the driven disk with compressed paper. The driven disk is slid across the face of the driver by a hand lever and is pressed against it by a pedal. The arrangement of the parts is clearly shown.

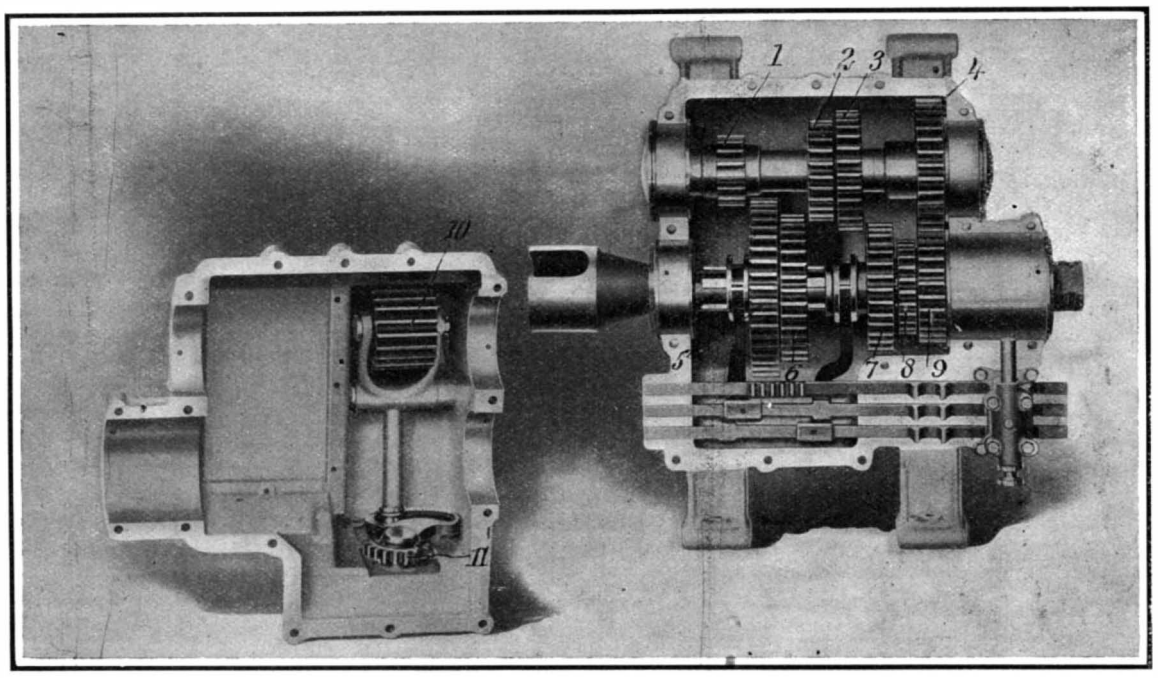
three spur gears mounted on a short countershaft carried in a yoke and placed beside the differential. This yoke can be moved forward and backward in a suitable bearing, and thus the gears can be brought face-on against the spur gear of the differential when once they are located opposite it. The location of the gears the larger bevel, which it drives. In order to obtain the reverse there is a small spur pinion mounted in the case of the transmission, which can be brought into mesh with the spur gear on the differential, and also with the large spur gear on the countershaft, thus obtaining a reverse motion. The idea of bringing the car. In all probability, after its good points become thoroughly known, transmissions of this type will be applied to larger cars.

The idea of having a transmission combined with the rear axle seems to be gaining ground in this country, and at the automobile shows there were some half dozen cars thus equipped. A sliding gear transmission mounted in this manner is that shown below. This transmission is that found on the new Pennsylvania car. It is an ordinary transmission of the sliding gear type, but is located in a suitable casing forming part of the rear axle. This arrangement does away with the location of the transmission as a separate member beneath the floor of the car, and makes it possible to have a long straight propeller shaft reaching from the engine directly to the rear axle. It is possible to make the propeller shaft keep more nearly horizontal and to reduce the angularity which has to be taken care of by the universal joint. The other distinct method of arranging the transmission is to place it next to the crankshaft of the engine and have both cases bolted together, thus forming a unit of the engine and transmission. This arrangement also seems to be gaining in favor, and it has several new adherents among the builders of 1908 machines.



THE COMBINED TRANSMISSION AND REAR AXLE OF THE PENNSYLVANIA CAR.

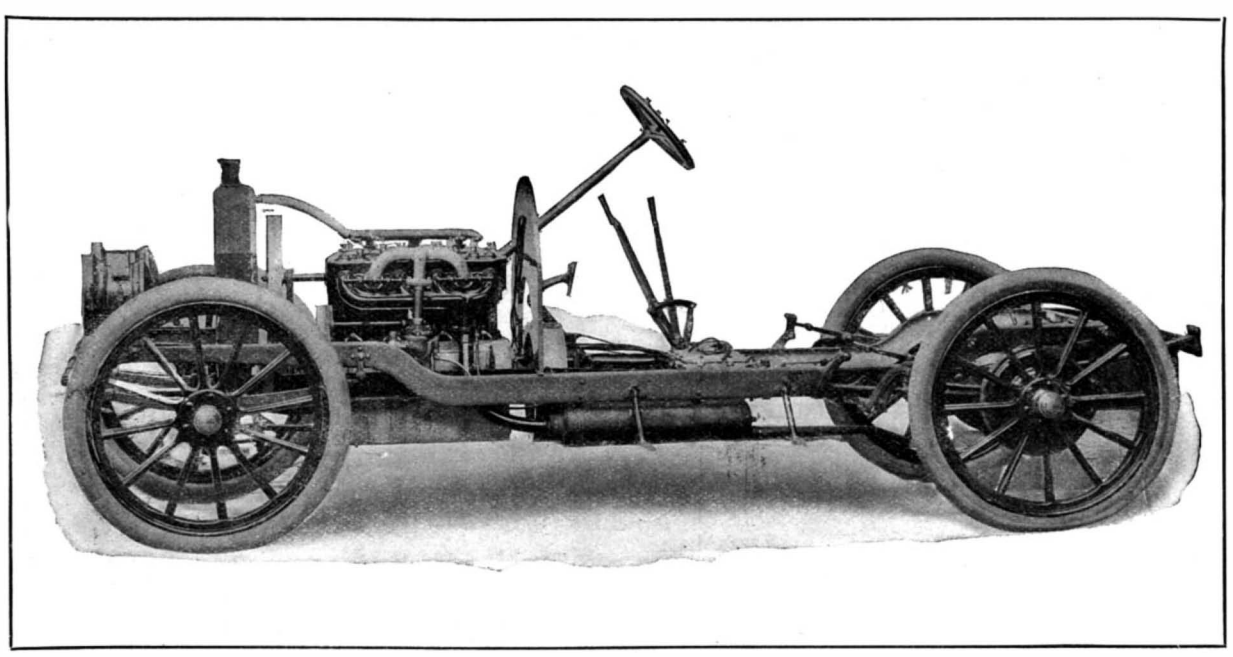
This location of the transmission is gradually coming into vogue. It makes possible a straight line drive from the engine to the rear axle, which results in less loss of power in the universals.



THE PEERLESS FOUR-SPEED SELECTIVE TYPE, SLIDING-GEAR TRANSMISSION.

There are two pairs of sliding gears, viz., 5 and 6, and 7 and 8. The speeds are obtained as follows: Low speed through 9, 4, 1, 5. Second speed through 9, 4, 2, 6. Third speed through gears 9, 4, 3, 7. Fourth speed (direct drive) by telescoping gear 8 into gear 9. The reverse is obtained with gears in position shown by lowering 10 into contact with 1 and 5. A cam connected to gear 11 positively holds the gear 10 out of engagement while the other gears are in mesh. Toothed segment 11 is operated by a rack on one of the three sliding bars.

in the proper direction is accomplished by sliding them upon the short shaft. The large bevel gear upon this shaft meshes with the bevel pinion upon the propeller shaft, and this pinion is also arranged to slide upon the shaft, so that it can go forward or backward with the yoke, and thus always keep in mesh with gears into mesh face-on was first used some years ago on the Renault car, in Paris, but there has been no subsequent development in this line until this little transmission was brought out. The device is found upon a small 4-cylinder runabout of the air-cooled type, and it has been very thoroughly tried out upon this



SIDE VIEW OF IMPERIAL CHASSIS, SHOWING THE DOUBLE DROPPED FRAME.

This is a new type of frame. The object of this construction is to make the center of gravity of the car as low as possible, and also to keep the universally-jointed driving shaft in a straight line. The engine is mounted upon a sub-frame. The location of the radiator back of the front axle should also be noted. The rear drop in the frame gives greater leg room to the occupants of the surrey-type rear seats.

trate, for in this instance the designer has made a double drop in the frame, so that the whole center part is at a lower level than the forward and rear end. The main advantage of this method of forming the frame is claimed to be its great strength, while the secondary advantages are a lower center of gravity and a greater road clearance for the car. This shape of frame, it is claimed, follows the principles embodied in the more recent Pullman car construction, whereby great rigidity and strength are obtained. The motor is mounted upon a sub-frame, and made to line up with the transmission, which is hung from arms that are attached to the members of the main frame. On account of the drop of the frame, the rear shaft of the transmission is made to line perfectly with the propeller shaft when the car is going. The result is that practically all the time the propeller shaft is perfectly in line with the transmission and the crankshaft of the engine. Although two universal joints are fitted to the propeller shaft, these are rarely in operation when the car is running along on the road and power is being transmitted to the rear axle. The claim is made by the builders of the Imperial car, that from 7½ to 25 per cent of the engine power which should be delivered to the rear wheels is lost by bad alinement.

THE IMPERIAL CHASSIS.

The practice of dropping the frame just forward of the rear axle, which has been entered into by a number of the leading automobile manufacturers, with a view to lowering the center of gravity of the car and also of helping to bring the transmission and the power shaft in a direct line with the engine, has been carried still farther in the new Imperial car which we illus-

THE LAMBERT FRICTION-DRIVE CHASSIS.

The chassis shown above is a typical one employing the friction-disk transmission. An 18-horse-power, double-opposed-cylinder motor of 5 inches bore and 4 inches stroke is mounted in front and carries, on an extension of its crankshaft, a large aluminium-faced

(*Continued on page 342.*)

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TYPES OF SHOCK ABSORBERS FOR AUTOMOBILES.

BY HOWARD GREENE.

Years of study and experimenting have been spent in the effort of evolving from the carriage spring a type of spring adapted for the suspension of automobile bodies on their chassis. At last a form of spring has been produced which possesses the maximum degree of strength and flexibility in proportion to weight and size.

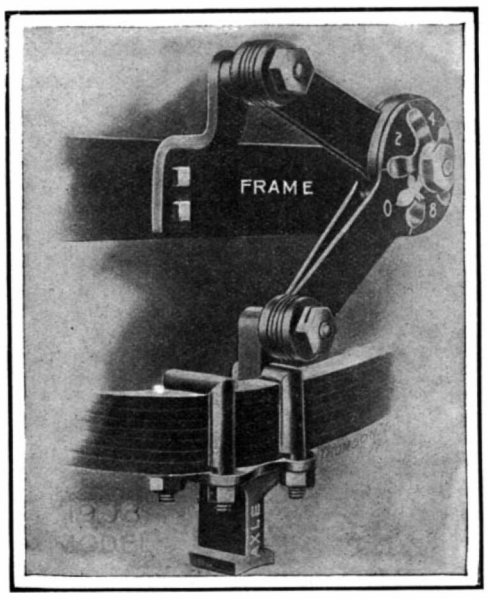

Fig. 1.—The 1908 Truffault-Hartford Shock Absorber.

The highest possible elasticity is necessary in order to afford comfort to the passengers, while tensile strength is needed to resist the severe shocks incident to driving rapidly over uneven and rough roads. The high elasticity which is so essential in the automobile spring has been found to possess one serious drawback, however; that is, an excessive rebound. All the useful work of the spring has been done when, in passing over an obstruction, the spring has been compressed and then returns to its normal position on the first rebound. In practice the action of the spring does not cease there, but is succeeded by a series of vibratory movements, as a rubber ball bounds and rebounds many times when thrown upon a stone pavement, unless the motion is checked by catching the ball in the hands. Breakages of springs often result from the excessive rebound after compression. When the spring is suddenly compressed or flexed downward as the wheel passes over an obstruction, the long top leaf is supported below by the shorter leaves; but unless clips are provided to hold the leaves together, the momentum of the body and its load on the upward rebound is liable to lift the free ends of the top leaf away from the lower leaves, and cause it to break where it is secured at the center.

The purpose of the shock absorber is to check the tendency to excessive rebounds, stopping the disagreeable vibration of the vehicle body, and preventing breakage of springs from this cause. Like many other automobile improvements, we are indebted for it very largely to the big international automobile road races. The excessive bounding of the light racing cars when traveling at terrific speeds over the roads proved exceedingly dangerous, and devices were designed to check this action and make the cars ride more evenly. The first and one of the most successful devices of this kind was applied to racing cars in France five years ago. Since then a number of changes and improvements have been made, and the device, which is known as the Truffault-Hartford, is now part of the regular equipment of several high-grade American and French cars.

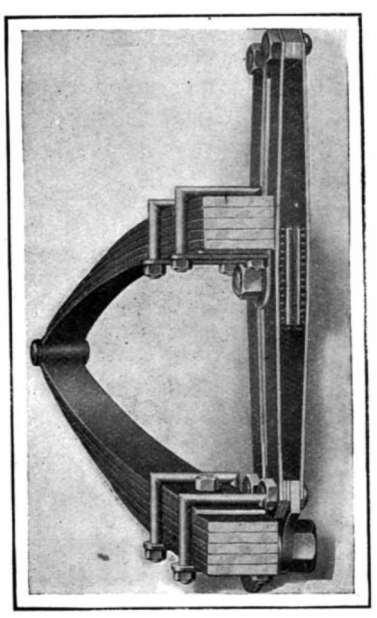

Fig. 4.—Gabriel Shock Absorber Attached.

Since its first introduction the shock absorber has grown rapidly in popularity with automobile owners, and nearly a score of American inventions of devices for a similar purpose have been brought out and are now on the market. These are of a variety of types, which may be divided into friction checks, hydraulic checks, pneumatic shock absorbers, and supplementary spring devices. In addition to the mechanisms belonging to these main divisions or principal classifications, there are a number of devices that make use of a combination of two of the general principles, such as hydraulic and friction and spring and friction. All are constructed to be attached at one end to the spring or rear axle near the middle of the spring, and at the other end to the side of the frame above the axle, so that the resistance which it offers will act directly between the spring and the frame.

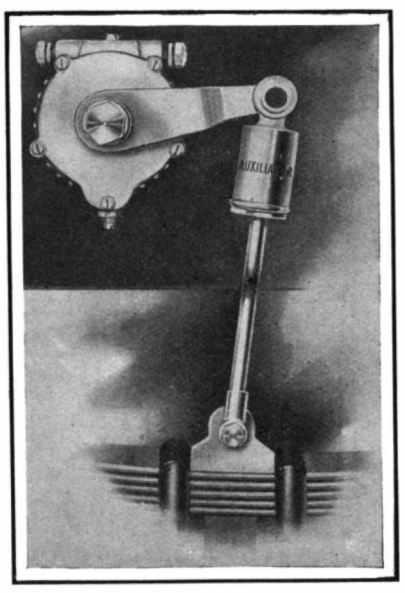

Fig. 2.—General View of the Paternoster Shock Absorber Attached to Car.

The Truffault-Hartford, which is made by the Hartford Suspension Company, of New York, and is illustrated in Fig. 1, belongs to the friction type and is of the simplest construction. In general form it is like the stop of a trunk lid. The end of one arm is held by a stud on a plate that is bolted to the side of the car frame, and the small ends of a pair of other arms are attached by a bolt to a plate that is held by the spring clamps. The other ends of the arms are enlarged into circular friction plates, the end of the upper arm being placed between the disks of the pair of lower arms. The arms are joined together firmly by a center stud fitted with a hardened steel bushing. Under the nut of the stud on one side is a star-shaped spring steel washer, that maintains constant compression on the friction plates and compensates for wear. An absorbent friction material is interposed between the faces of the disks, increasing the friction and at the same time providing a receptacle for retaining lubricant, enough of which is held in the material to last indefinitely. The device is both dustproof and waterproof, and each set is tested to a uniform tension. All arms are of equal length, making the suspension uniform and the shock absorbers interchangeable.

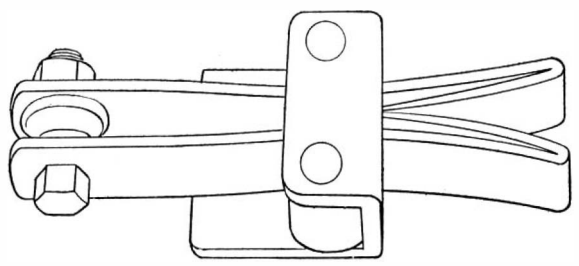

Fig. 5.—Shippey Shock Absorber—Non-Friction Spring Action.

This form of shock absorber is simple, strong, unobtrusive, and durable. It acts in both directions, that is, against the compression and against the rebound of the car springs, acting as a brake to vibration. It does not have the same effect as the use of a stiffer spring, but, while leaving the springs as flexible and responsive as before, stops excessive play and absorbs the shocks by converting motion into frictional heat.

Many virtues are claimed for this shock absorber. Besides preventing breakage of springs in the way mentioned and increasing the comfort of riding, its use prevents racking of the car by reducing the rolling and pitching motions, saves wear on the tires by reducing skidding and making the use of brakes less often necessary, obviates the need of slowing down for ordinary crosswalks and holes in the road surface, and, by checking the rebound and keeping the wheels constantly in contact with the road, utilizes more of the power developed by the engine, thereby also increasing in some degree the speed of the machine.

The principle and general form of the Hartford shock absorber have been extensively copied, and a number of devices have been patented and offered for sale during the last two or three years that differ from it only in detail, such as the mechanical means for developing the friction.

It is held by many students of the subject that only the recoil of the spring should be checked, or that it should be checked more than the compression. Acting under this belief, a European inventor in 1905 patented the Paternoster shock absorber, which is now manufactured and on the market in this country. A general view of this attached to a car, is given in Fig. 2. The frictional elements are contained in a circular case attached to the frame, while the link from the arm to the spring is provided with a small cylindrical case that incloses two soft-rubber buffer springs, between which plays a plunger on the end of the rod. This device is called an "auxiliator," and is intended to permit a certain amount of play of the springs to go unchecked, when running over smooth roads.

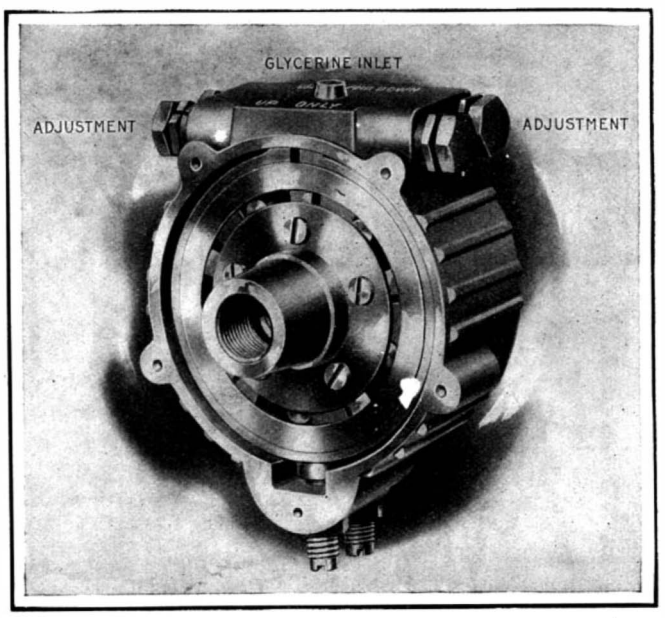

Fig. 3.—Roller Clutch, Brake Bands, and Adjustments of the Paternoster Shock Absorber.

Within the circular case attached to the frame of the car are two brake drums, each encircled by a stationary brake band. The bands are adjustable, so far as their pressure on the drums is concerned, by means of screw adjustments which can be manipulated from the outside of the case. One of the drums is connected with the arm rigidly and permanently, while the other is loose on a central arbor cast integral with the case, but is adapted to engage with the arm by means of a roller clutch (Fig. 3) only during the upward movement of the car spring, when there is danger of breakage of the spring and a certainty of a "toss" of the occupants of the car if a full rebound is permitted. Thus there is only one brake acting on the downward movement or compression of the spring, when the stresses are of a legitimate character, but two brakes act, producing twice as much friction, on the upward movement or rebound. The brake bands are of steel, hardened and ground on the wearing surfaces; wear can be taken up and accurate adjustments made by means of the screws already referred to, so that the checking action can be suited to the individual car. The bronze case containing the drums, brake bands, and clutch is closed by a tight cover with a ground joint and is filled with glycerine, which affords excellent lubrication and at the same time acts as a medium for conveying heat away from the brakes and drums.

(*Continued on page 349.*)

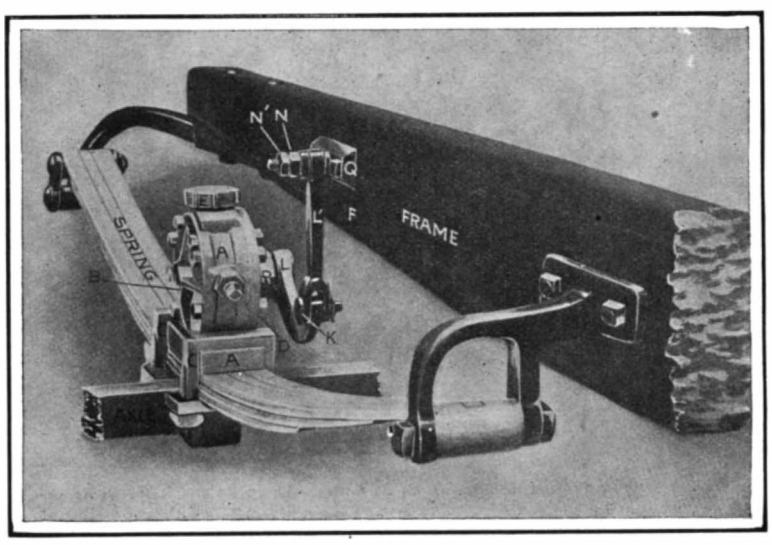

Fig. 6.—Hotchkin Hydraulic Anti-Jolt Device Attached.

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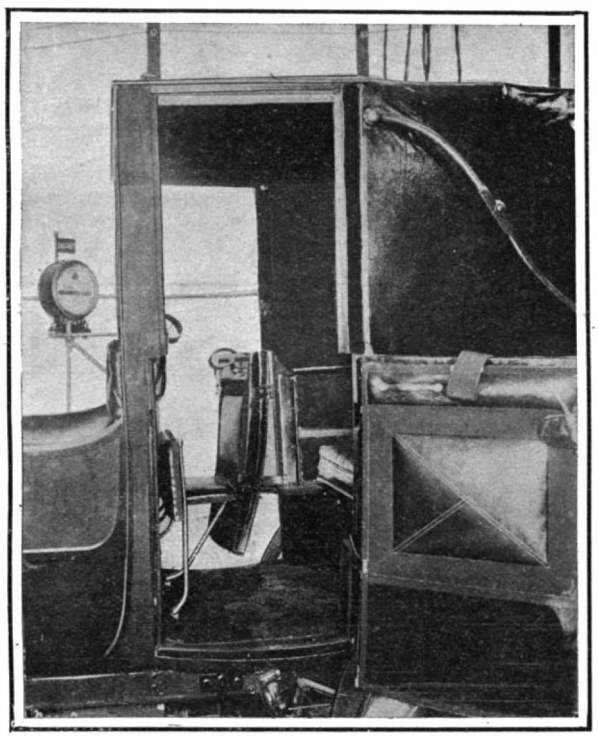
TAXIMETER MOTOR CABS IN AMERICA.

BY HARRY W. PERRY.

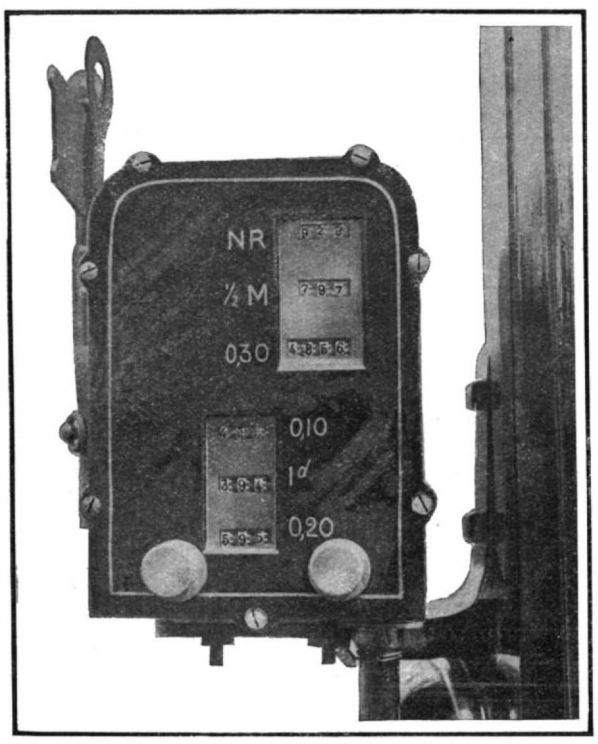
Landaulet cabs driven by internal-combustion motors using gasoline for fuel were put in operation as public hacks in New York on October 1 last. They are of the type that has become popular in Paris and London during the last two or three years, being, in fact, of French manufacture, and imported to America upon the order of two companies. Of these companies, one is now operating Delahaye and the other Darracq vehicles. For the company operating the Delahaye cabs, the tariff is now as follows: For one or two passengers: First half mile or fraction, 30 cents; each quarter mile thereafter, 10 cents; each four minutes of waiting, 10 cents. For three, four, or five passengers: First one-third mile or fraction, 30 cents; each one-sixth mile thereafter, 10 cents; each four minutes of waiting, 10 cents. Extra for ordering cab, each mile or fraction from stand or station to point ordered, 20 cents; for trunk, 20 cents.

Shipments of the remaining twenty-five Delahaye cabs of the first lot of fifty ordered were received during October, and the work of fitting them with American pneumatic tires, and German taximeter instruments for automatically calculating the fare to be paid by the passenger, is still in progress. All of the new gasoline cabs are equipped with taximeters before they are put on the streets.

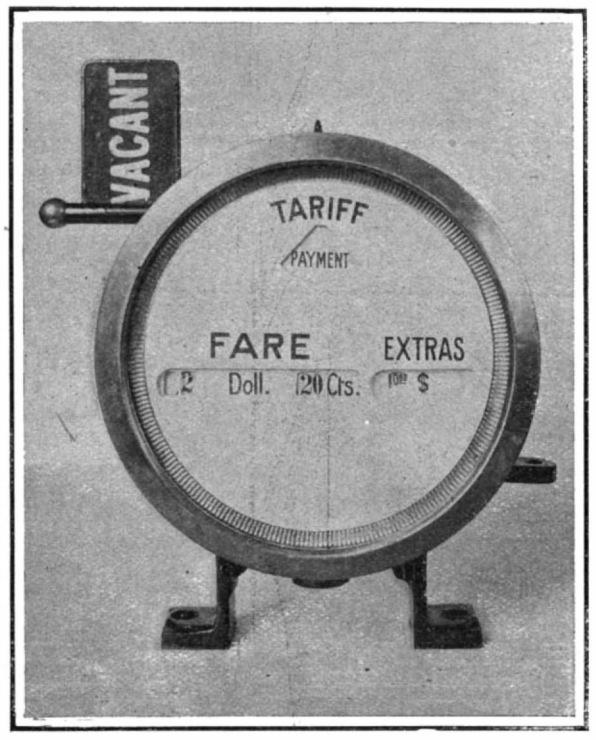
The cabs have yellow running gears, olive-green bodies with black and yellow striping, and black tops trimmed with brass. The front inside seats are upholstered in smooth, black leather, which is also used for lining the lower half of the interior. It is serviceable and sanitary, and appropriate for the public service to which the cabs are put. The folding top is lined with very dark green broadcloth. All windows, of which there are six, let down into the body out of sight for fair weather. The permanent furnishings that contribute to the comfort of the passengers are two small drop seats suitable for children or adults of small size, two large side pockets for papers and programmes, an opera-glass holder and a cigar holder, and a narrow mirror set between the front windows. Without body, the chassis weighs 1,300 pounds, has a wheel base of 101½ inches and tread of 48½ inches, with a turning radius of 19 feet. The frame is of pressed steel, and has no bends back of the dash. It measures 8 feet from the dash to the rear end.



Interior of Delahaye Landaulet, Showing Taximeter Easily Read from Inside and Folding Seats Between Doors.



Rear of Popp Taximeter Used on Darracq Cabs. Face of Instrument Visible from Inside of Cab.



Face of German Taximeter Used on Delahaye Landaulet Cabs.

The taximeters are circular instruments about the size of street-car fare registers. Unlike the latter, however, they are automatic in action, calculating and indicating at all stages of the trip the precise amount of fare the customer has to pay, thereby eliminating any possibility of the driver making excessive charges, and pocketing a part of the receipts for himself. Although the mechanism is complicated, the principles are readily explained and understood. Each instrument contains clockwork, which drives the gears that operate the registering dials, while the cab is engaged but is standing still, as when waiting at a store or residence while the customer is shopping or calling. This computation by clockwork begins as soon as the passenger engages the cab and the driver turns down the small metal flag bearing the word "Vacant." But as soon as the cab begins to go, the work of driving the registering gearing is taken up by a flexible shaft, which is driven by one of the front wheels of the vehicle in the same way as a speed-indicating instrument, the speed of this shaft overrunning that of the clockwork. The indicating mechanism is similar in principle to the well-known cyclometer or odometer. On the face of the instrument, which is turned so as to be plainly visible from the inside of the cab, there are dials which indicate the "Tariff," whether No. 1 for one or two passengers, or No. 2 for three, four, or five passengers; the amount of fare to be paid and the charge for extras. On the back of the instrument are smaller openings, where figures that change automatically show the total and daily mileage covered by the machine and the hours of service for the information of the operating company. Since the adoption of the taximeters, the drivers are paid regular daily wages plus a percentage of the daily receipts.

The other company which is operating taximeter cabs was organized last spring, and employs Darracq cabs. A first lot of thirty landaulets was received during September and October, and after being fitted with American tires, were placed in public service, being installed first at hotel stands. The service is to be extended as further shipments are received, contracts having been made by the parent company with the Darracq works for the delivery of six hundred cabs to be shipped at the rate of seventy-five a month. They are being landed this fall at the rate of fifteen a week. Temporary quarters for their storage and care have been leased until May 1 on West 60th Street, between Broadway and Columbus Avenue. By the date named it is expected that a large garage, for which plans have been drawn and contracts let, will be completed on West 57th Street, between 11th and 12th Avenues, at an estimated cost of $250,000. It is to be 225 by 150 feet, four stories high, and fireproof.

The cabs have dark green running gears, red bodies, and black leather tops. The interior is upholstered throughout in light tan-colored corduroy. Taximeters operating on the same principles as those previously described, but of different form and made under the Popp patents in Paris, are fitted to all the cabs. Only a single tariff is charged, however, whether the cab is occupied by one or four persons, the rates being the same as under tariff No. 1 of the other company; but if a cab is dismissed north of 125th Street or anywhere outside of Manhattan Borough, a charge of 40 cents a mile is made for the return trip.

The Delahaye 10-Horse-Power Cab Fitted with Taximeter.

The 14-16-Horse-Power Darracq Taximeter Cab.

TAXIMETER MOTOR CABS IN AMERICA.

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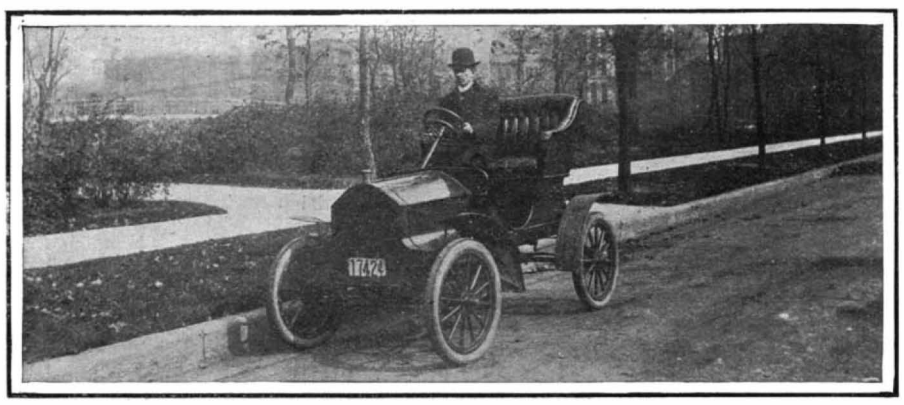
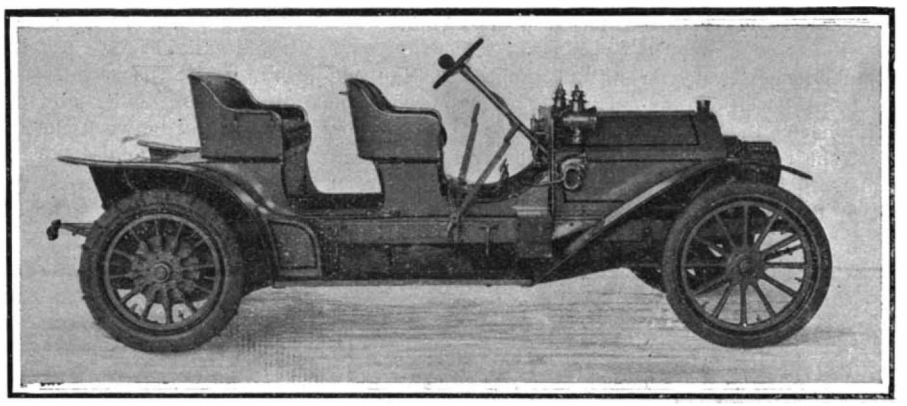


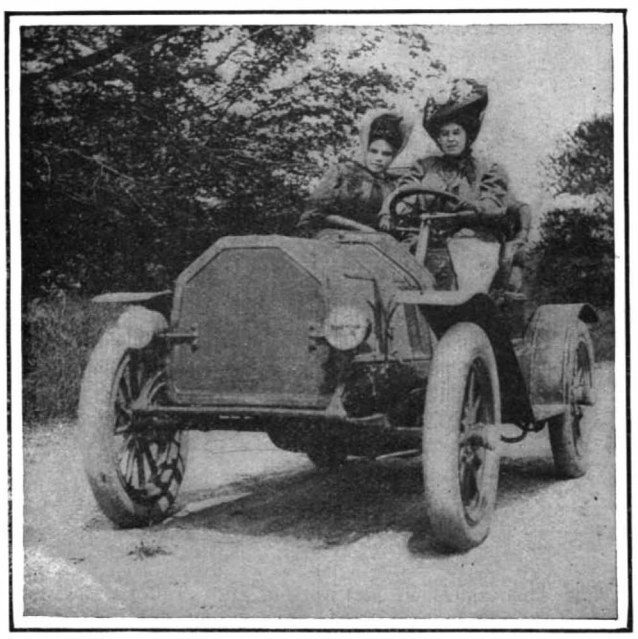
The Star—A Novel Two-Cycle Runabout with Friction Disk Transmission.

Engine: Single-cylinder, two-cycle of 10 horse-power, water-cooled, and located in front under bonnet. Drive: Single chain. Transmission: Friction disk, with disk shifted by hand wheel below steering wheel.



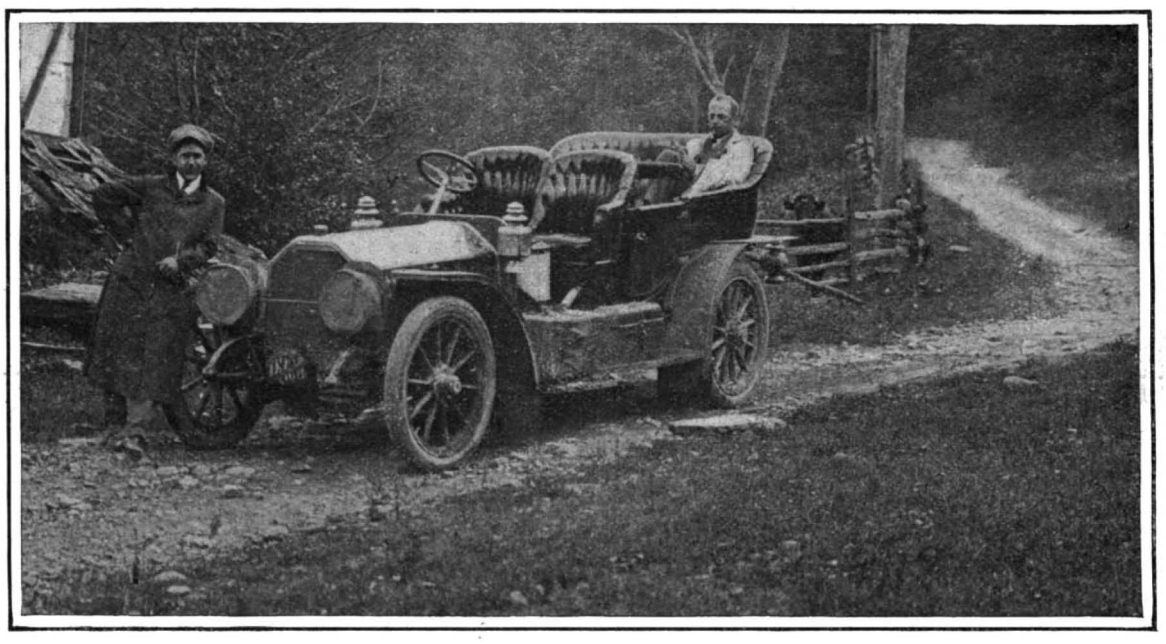
The Simplex Four-Passenger, 50-Horse-Power Roadster.

Engine: 5¾ x 5¾, four-cylinder, with ball-bearing crankshaft. Transmission: Four-speed selective type, with direct drive on the fourth speed. Drive: Double side chain. Weight: 2,500 pounds. Wheel base: 124 inches. Tires: 36 x 4½ and 36½ x 5⅝



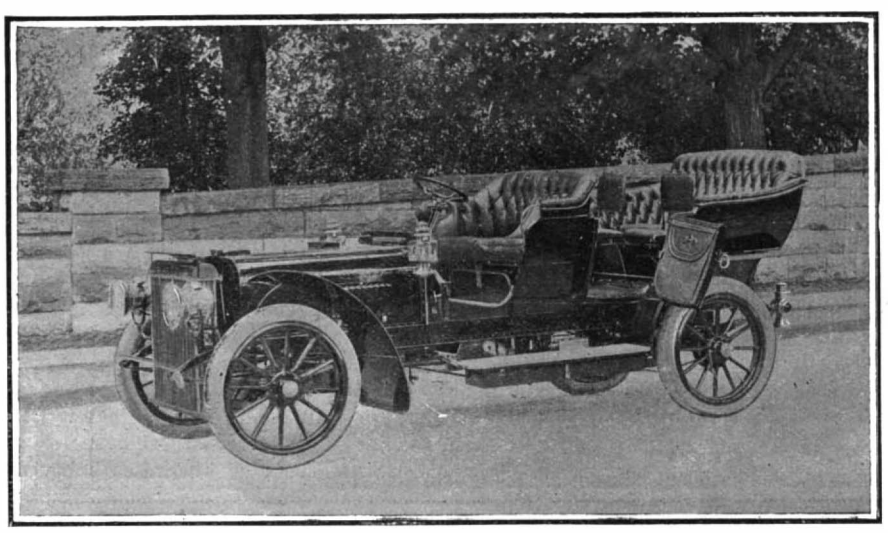
A Powerful Electric Touring Runabout

This runabout is capable of covering about 80 miles across country at an average speed of between 15 and 20 miles an hour. It has twenty-four 150-ampere-hour cells, a 3-horse-power motor, and 5-inch pneumatics.



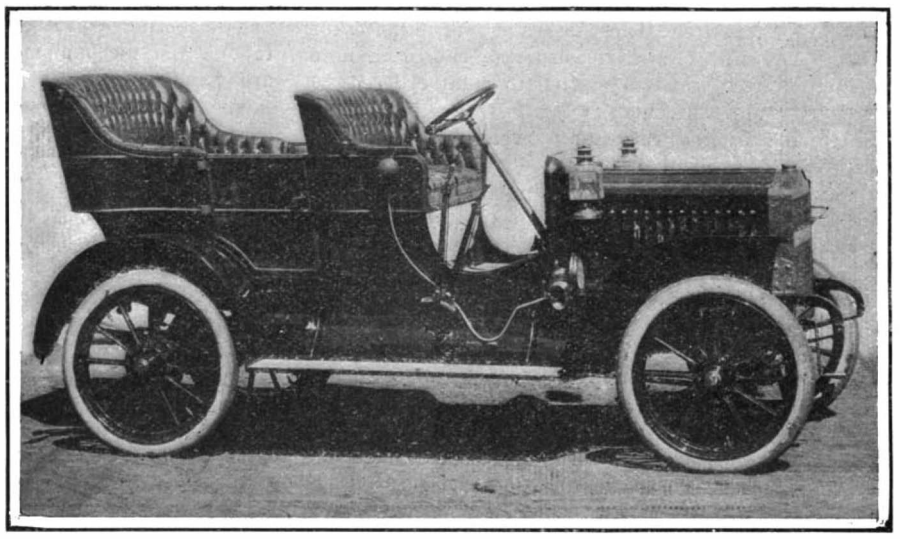
The Peerless 57-Horse-Power Six-Cylinder Touring Car.

Engine: 4⅞ x 5½, six-cylinder, water-cooled. Transmission: Four-speed selective type. Drive: Shaft. Weight: 3,800 pounds. Wheel base: 133⅓ inches. Tires: 36 x 4 and 36 x 5.



The Lane 20-Horse-Power Steam Touring Car.

Engine: 3¼ and 5¼ x 3½ inch, compound. Boiler: 20-inch; pressure, 325 pounds. Burner: Lane tubular type. Drive: Single chain. Weight: 2,300 pounds. Wheel base: 97 inches. Tires: 32 x 4.

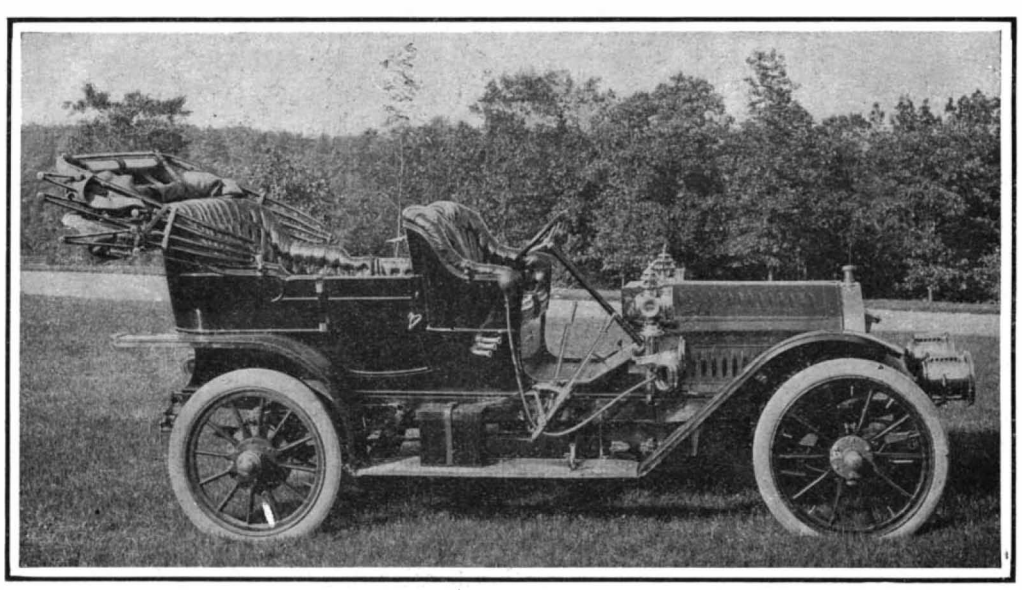


The Maxwell 16-20-Horse-Power Light Touring Car.

Engine: 4¼ x 4¼, four-cylinder, vertical, water-cooled. Transmission: Three-speed sliding gear, progressive type. Drive: Shaft. Clutch: Multiple disk in gear box. Wheel base: 96 inches. Weight: 2,100 pounds. Tires: 32 x 3½.

The Holsman High-Wheeled Limousine.

Engine: 4 x 4 double-opposed cylinder, air-cooled. Transmission: Two Morse chains to countershaft. Drive: Steel cables to rear wheels. Weight: 900 pounds. Wheel base: 75 inches. Tires: Solid rubber, 1½ x 44 and 1½ x 48.



The Mora 50-Horse-Power, Six-Cylinder Touring Car.

Engine: 4 x 5½, six-cylinder, water-cooled. Clutch: Cone. Transmission: Three-speed selective. Drive: Shaft. Weight: 2,500 pounds. Wheel base: 114 inches. Tires: 36 x 6. Note the bonnet which is apparently no longer than that of a 4-cylinder car. The engine and transmission of this car form a unit.

SOME LEADING TYPES OF 1908 AUTOMOBILES.

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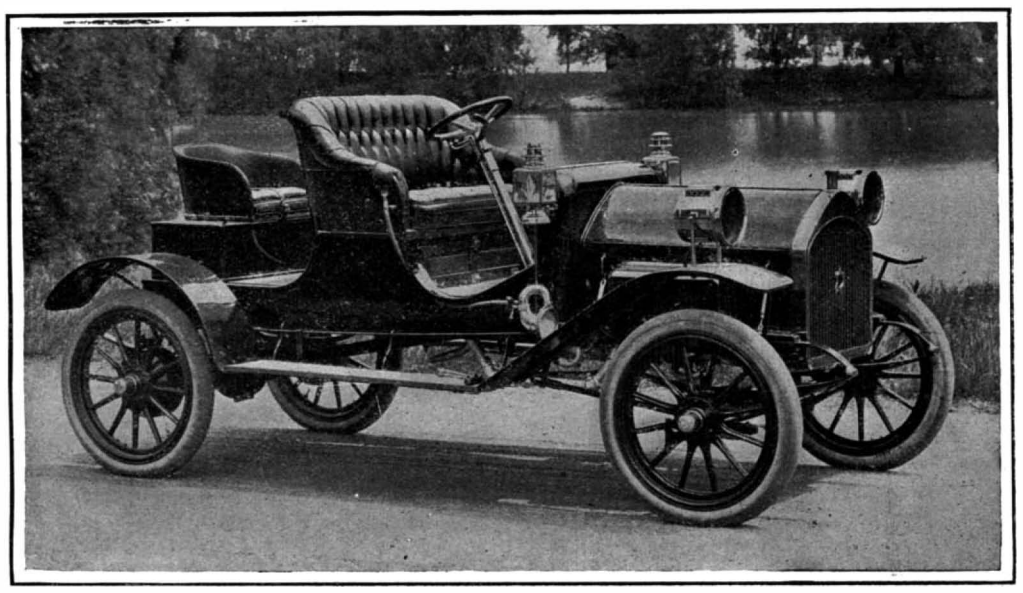
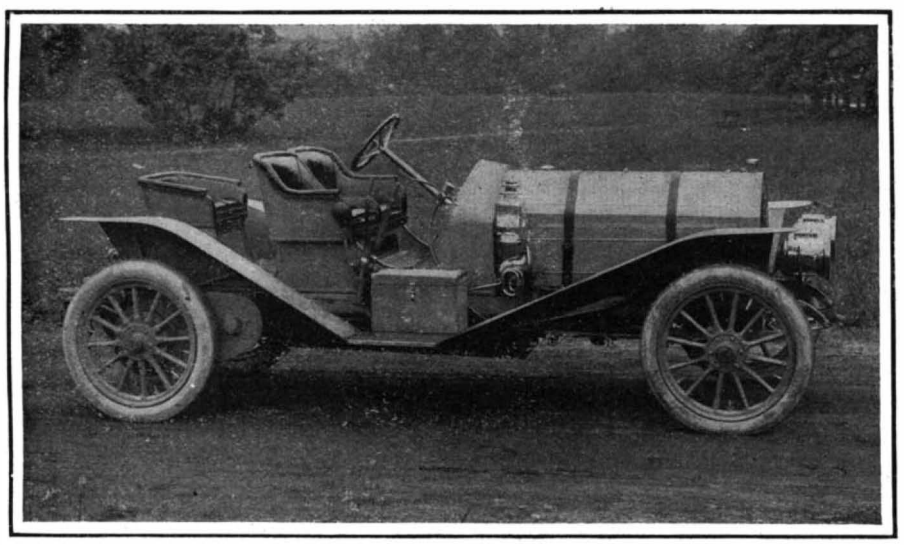


The Northern 24-Horse-Power Runabout.

Engine: 5⅛ x 5¼ double-opposed-cylinder, water-cooled. Transmission: Two-speed planetary. Drive: Shaft. Weight: 2,000 pounds. Wheel base: 106 inches. Tires: 32 x 3½.

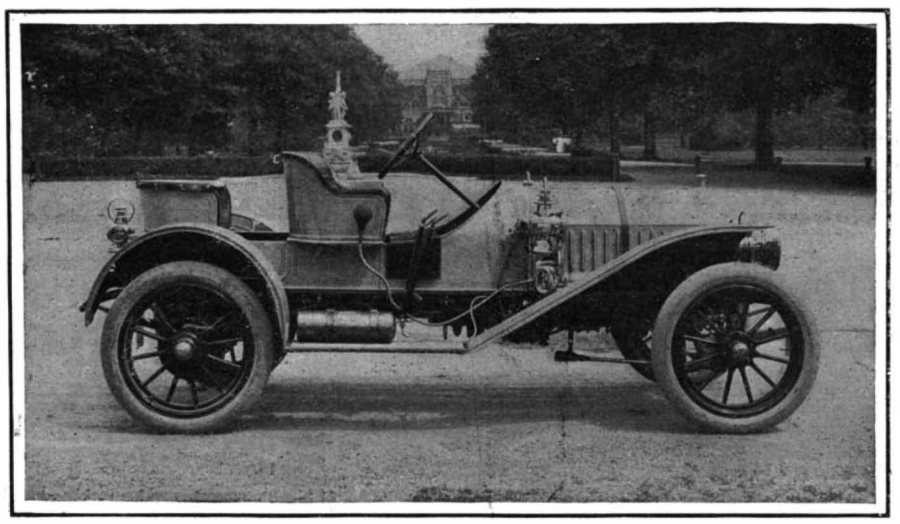
The Cadillac 10-Horse Power Coupe.

Engine: 5 x 5, single-cylinder, water-cooled. Transmission: Two-speed planetary gear. Drive: Single chain. Weight: 1,400 pounds. Wheel base: 74 inches. Tires: 28 x 3½.



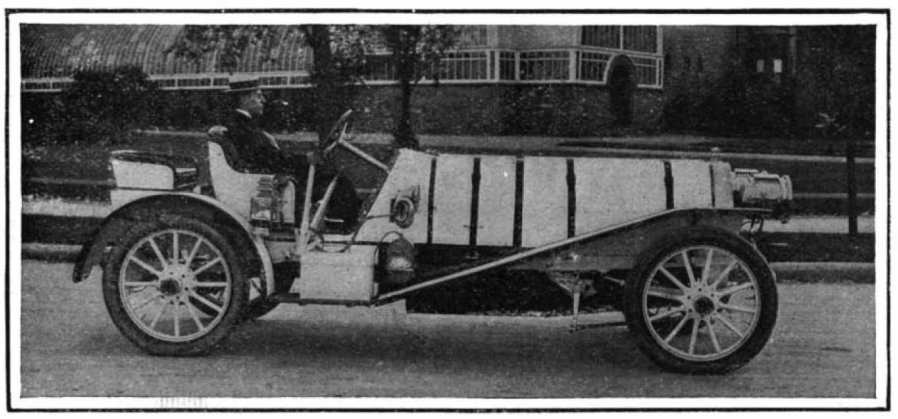
The Chadwick 50-Horse-Power Touring Runabout.

Engine: 5 x 6, six-cylinder, water-cooled. Clutch: Cone with cork inserts. Transmission: Four-speed selective type. Drive: Double side chain, with chains encased. Weight: 2,800 pounds. Wheel base: 134 inches. Tires: 34 x 4 and 36 x 5.



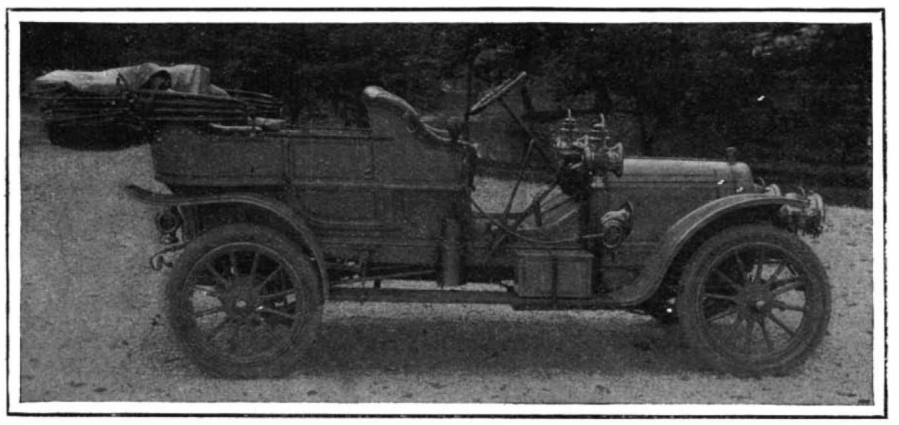
The Autocar 30-35-Horse-Power Gentleman's Roadster.

Engine: 4¼ x 4½, four-cylinder, water-cooled. Clutch: Floating ring with cork inserts. Transmission: Three-speed selective. Drive: Shaft. Weight: 2,400 pounds. Wheel base: 112 inches. Tires: 34 x 4.



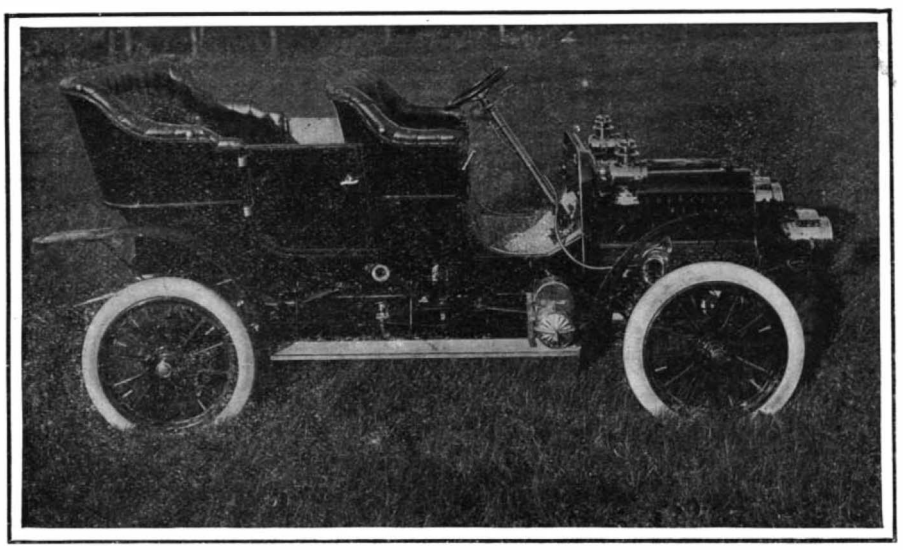
The Gearless 75-Horse-Power Six-Cylinder Runabout.

Engine: 4⅛ x 5½, 6-cylinder, water-cooled. Clutch: Metal expanding ring. Transmission: Two-speed planetary with friction rollers in place of gears. Drive: Shaft. Weight: 3,000 pounds. Wheel base: 126 inches. Tires: 36 x 4.



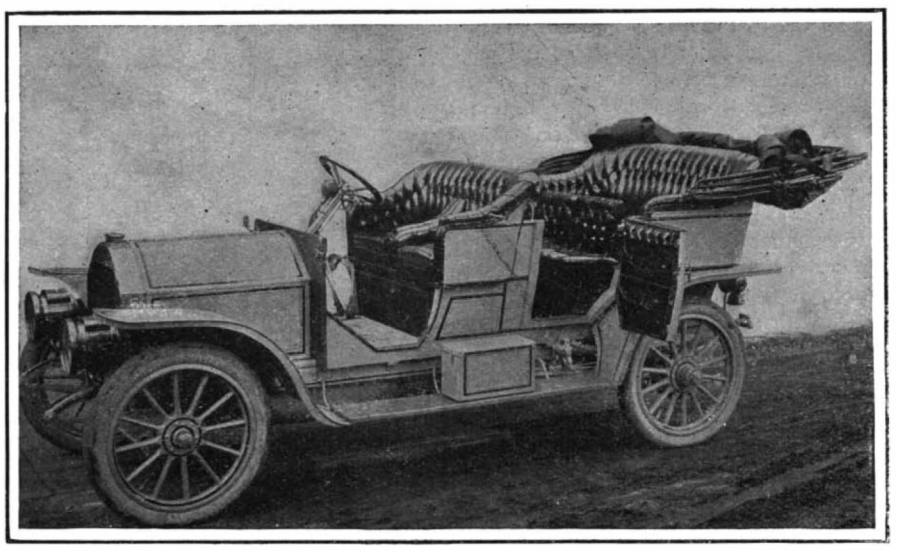
The Haynes 45-Horse-Power Four-Cylinder Touring Car.

Engine: 4¾ x 5, 4-cylinder, water-cooled; two flywheels. Clutch: Contracting band. Transmission: Three-speed selective. Drive: Shaft. Weight: 2,400 pounds. Wheel base: 106 inches. Tires: 34 x 4.



The Moline 18-Horse-Power Two-Cylinder Touring Car.

Engine: 5 x 5, double-opposed-cylinder, water-cooled. Transmission: Two-speed planetary. Drive: Single chain. Weight: 1,800 pounds. Wheel base: 92 inches. Tires: 30 x 3½.



The Stoddard-Dayton 30-35-Horse-Power, Four-Cylinder Touring Car.

Engine: 4⅜ x 5, four-cylinder, water-cooled, with valves in heads. Clutch: Cone. Transmission: Three-speed selective. Drive: Shaft. Weight: 3,000 pounds. Wheel base: 113 inches. Tires: 34 x 4 and 34 x 4½.

SOME LEADING TYPES OF 1908 AUTOMOBILES.

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HOW TO TOUR IN AN AUTOMOBILE.

BY HARRY B. HAINES.

Ideas differ widely, of course, as to the most suitable type of car for touring. Many enthusiastic motorists who have toured thousands of miles prefer to drive in a light high-powered runabout of the style that has leaped into sudden popularity within a year. A strictly limited amount of baggage can be stowed away on the rear deck in a leather waterproof bag or in a steamer trunk strapped on the deck, and a rubber poncho can be carried for protection against rain. With powerful headlights for night driving, and a good blanket for sleeping out at night, if necessary, one can drive for days through the roughest country in remote mountain regions. He will, however, enjoy a sort of selfish pleasure, for at most he can carry only one friend and a mechanic, as the car has only one regular double seat, which is supplemented by a folding rumble seat behind that offers nothing in the way of comfort on a hard day's jaunt. The majority of tourists prefer the regular touring car, with side entrance body, having comfortable seating accommodations for five or seven persons. In such a car, properly fitted out for the purpose, a whole family may travel for weeks almost as luxuriously as in a Pullman railroad car, regardless of weather.

The Evening Meal.

After Pitching the Tent the Cooking Utensils are Soon Put in Use.

A Limited Amount of Baggage Can be Carried on the Folding Trunk Rack.

The question of suitable equipment for touring is one that requires considerable thought. It is possible to spend many hundreds of dollars for all sorts of fittings. Some of these are almost indispensable to comfort and satisfaction on the road, while others only serve to encumber the machine unnecessarily. Although each device may really serve a useful purpose, it should be remembered that, as in traveling by other means or when camping, the less paraphernalia one has to bother with, the greater is his ease of mind and his consequent enjoyment. Too often we pack along on a trip or vacation a bothersome quantity of stuff, much of which is never used. On the other hand, if we confine ourselves to the things that are really essential, we are likely to be surprised by the small amount of baggage that we have to take. Conceding that the automobile tourist desires simply to fit up his car with the attachments and devices that will add to the utility of the machine and to the comfort and safety of the passengers, there are certain things which it will be absolutely necessary for him to have. A comfortable Cape top and glass front are indispensable. In buying a Cape top one should also get a waterproof protector, to be slipped over the top when it is thrown back. This will keep the dirt and dust out of the lining and prove a profitable investment. The machine should be fitted with a set of good shock absorbers, to protect the springs from breakage when traveling over rough country and also for the purpose of adding to the comfort of the occupants. A dashboard speedometer-odometer is another necessity when touring. Driving directions in many route books simply give the measured distances between prominent landmarks in sparsely-settled country. For example, the book might read: "After passing large red farm house on left continue straight ahead a mile and a half and keep to right at fork in road." It will be seen that it is absolutely necessary to know when that mile and a half has been passed, and the odometer is the only instrument that will accurately give this information. The speedometer part of the combination is useful in view of the fact that speed ordinances and restrictions are becoming more severe every year, and when one is riding in an auto there is nothing more deceptive than speed. Even experienced men who have driven many thousands of miles are unable accurately to guess the speed at which a car is running, and five or ten miles an hour out of the way is no uncommon error. The speedometer will not cost much more than the fines a country justice may impose, to say nothing of the trouble and delay occasioned by arrest. Besides this, there is a great deal of truth in the statement, "It's nice to know how fast you go," and it is often fascinating to see the little needle on the instrument move up the scale as the car speeds steadily on under advanced spark and heavier charges of gas. When touring it is well to carry two new reserve tire shoes. When front and rear wheels are of different sizes, there should be one spare for each pair of tires. The new flat treads are recommended for the rear wheels, but not for the front, as they make steering rather difficult. Extra tires should be covered with waterproof and lightproof casings, as rubber deteriorates when exposed to the light. It is advisable to carry at least two rear inner tubes and one front tube; when touring myself I invariably carry four rear tubes and two front tubes, having experienced as many as five punctures in a single day. Tire troubles are due to various causes, and it is well to be prepared for them. A pigskin repair cover will be found valuable in temporarily fixing a blown-out casing. In the event of a puncture it is advisable to insert a new inner tube rather than to repair an old one, as it is almost impossible to make a satisfactory repair job on the road. Inner tubes for use in rear shoes should never be repaired with rubber patches cemented on. The heat caused by road friction melts these patches off. The only sure way is to have the tube vulcanized. Inner tubes should not be carried loose in a storage box, but should be put up in separate bags liberally sprinkled with French chalk, in order that they may not become chafed and so be rendered unfit for use.

A Tent Can be Carried Along in Case the Tourists Wish to Camp Out.

It is Well to Carry New Reserve Tire Shoes.

An experienced tourist is not ready to start until the car is equipped with a full set of tools, extra valves, valve springs, spark plugs, and such small moving parts of the engine as are likely to wear quickly or break easily. Of course, this list will differ with each make of car. In machines that are chain driven, extra links of chain are carried in the toolbox. A jack, tire tools, and full tire repair kit are, of course, essential. In mountain touring it is necessary to have non-skid chains, which must be used when coming down long hills slippery with mud after a heavy rain. The car, unless equipped with these, may skid and become unmanageable. In the early days rope was tied around the rear wheels to give them traction, but the newer and more serviceable tire chains or non-skid treads have taken its place and made driving on slippery asphalt or "greasy" country roads much safer. Protection of the car and its occupants from mud and water has been looked after mostly by the manufacturer before the car left the factory. Cape tops and folding glass fronts do much to keep the car dry and comfortable in rainy weather. The machinery is also protected from mud and water by metal casings. It is advisable, however, to have mackintosh covers for the lamps when touring, so as to avoid the need of continual cleaning and polishing, and if the magneto is under the bonnet where rain may possibly reach the connections, they should be protected with a rubber arrangement suitable for that purpose. Many manufacturers neglect to furnish this, and as a consequence their cars have been stalled in wet weather by water getting into the magneto and short-circuiting it. The greatest care should be taken to keep water away from all the electrical parts of the machine.

It is possible, of course, to make a tent part of the equipment, but this will scarcely be used unless the party intends to camp out for the night. The automobile of to-day has such a wide radius of action by

HOW TO TOUR IN AN AUTOMOBILE.

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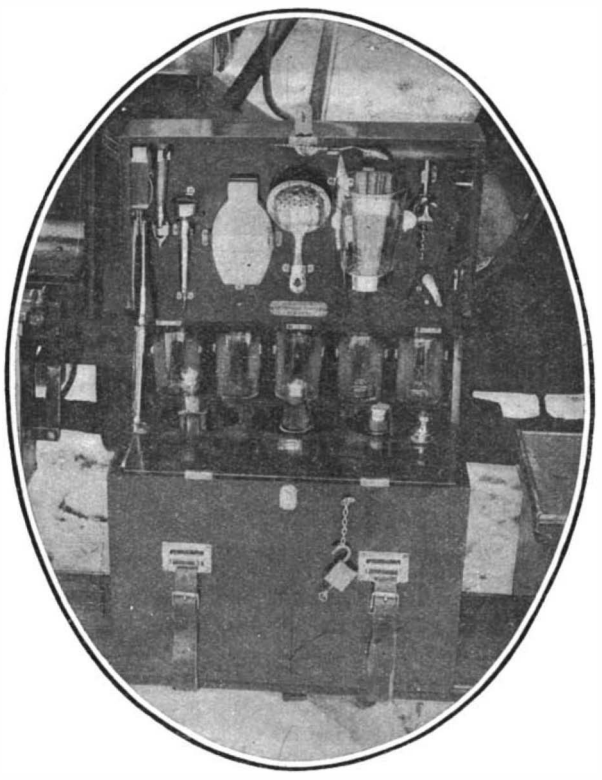
reason of its high speed that this is seldom necessary, as it is nearly always possible to reach a town or large city by night. It is best to have the car equipped with good headlights and a reliable generator or gas tank, as it sometimes becomes necessary to do night riding in a strange country. Even with good lamps it is never safe to drive faster than twenty miles an hour at night on roads with which one is not familiar, as danger can arise in an instant. The machine should always be kept under perfect control; half of the accidents that occur are due to careless driving.

Among the miscellaneous items that are needed and which come in very handy are a collapsible gasoline bucket with chamois strainer, collapsible water bucket, ammeter and voltmeter for testing the batteries, small electric flashlight to examine the car at night in the event of accident, and a dash clock.

Most cars of to-day have plenty of carrying and storage room. The extra tires are usually strapped to the running board with special holders. Inner tubes may be stored in the space under the rear seats. Extra boxes on the running board will provide a place for carrying tools, while a metal trunk rack fitted with leather auto trunks, that are dustproof and waterproof, will serve for baggage.

The modern touring car, properly equipped, is capable of railroad speed and will take a party safely across country, up hill and down, in rain or shine, with more pleasure than can be derived from any other method of transportation. The man who owns his automobile has his private car as luxurious as a Pullman, with all the roads of the country as his right



A Handy Refreshment Kit for the Tourist.

A Good Spot for Luncheon.

of way and no schedule other than that fixed by his own fancy and convenience.

The writer has always found it preferable to lay out the route intended to be followed. He has also found it a convenient practice to have a leather case made with a celluloid front in which the road directions can be placed. The map or directions can be read through the celluloid, which, however, protects them in case of rain. The easiest way to get along when asking road directions of natives in various towns is to know the name of the next following town and then ask the best road to it, if the road book directions are not explicit. For instance, before starting on a trip I generally take a map of the country through which I am going to travel and ascertain the various small towns through which I have to pass. These are listed, and as I proceed I inquire the way from one to another. This method has been found satisfactory, for when one asks the road directions to the larger cities, which may be ten, twenty, or more miles apart, it is difficult to find anyone who can direct you properly, but any boy or girl can tell you the best road to the next town, which will probably be from three to five miles away.

Having selected a route that you wish to travel, it is well to make out a time schedule and try to follow it, making due allowance in advance for delays *en route* and for the time that will be spent in viewing the scenery and points of interest.

You may have a 50-horse-power car, capable of a mile a minute speed, but if you are going to use the car for touring and expect to get any pleasure out of the tour, it would be better to have the machine geared down to forty miles an hour, so that it will have additional hill-climbing power. It is not the car that can go fastest on the level that can cover the greatest distance in a day, but rather the machine that is consistent in its performance and keeps "plugging" along, up hill and down, hour in and hour out, and always drawing steadily toward its destination. The tourist who really wants to see the country through which he is passing and to enjoy a sensible ride rather than a mad dash against time, would do well to plan his schedule on the basis of covering twenty miles an hour—or less, if he does not have a high-powered car. This would be slow on the smooth, level roads, but where the country is rolling, an average of twenty miles an hour is a good one, and to maintain it the car will be going at twenty-five and even thirty miles at many places. Besides, twenty miles is the legal limit in most States. Connecticut's new law, however, abolishes the speed limit but makes arrest possible for reckless driving if one travels over twenty-five miles an hour.

A Cape Top and Waterproof Protector are Indispensable.

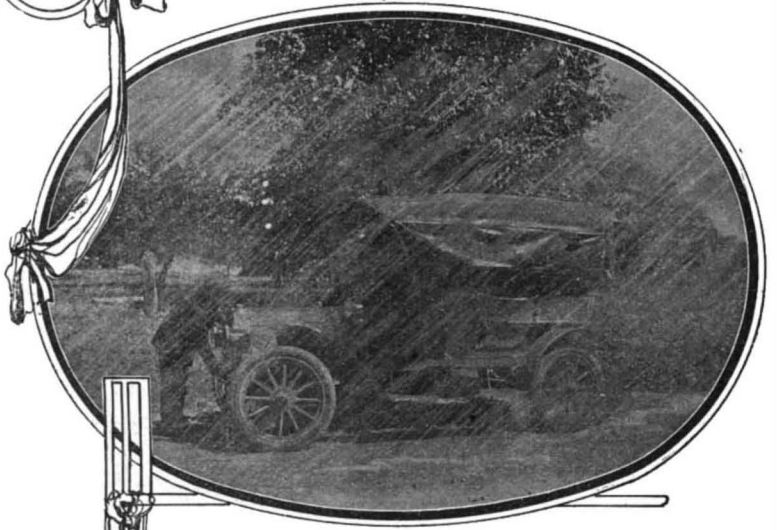
It is safe to presume that every motorist seeks to get as much pleasure and comfort out of touring as possible. The States of New York, New Jersey, Pennsylvania, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine offer not only the most beautiful and varied scenery but the finest of roads. One particularly beautiful route which I have had the pleasure of taking leads from New York city up along the west side of the Hudson River to Newburg and Pine Hill, N. Y., and then to Binghamton, Bath, and Buffalo, whence last year's Glidden Tour route may be followed to Rochester, Syracuse, Utica, Albany, Saratoga, and Lake Champlain, N. Y.; Three Rivers, Montreal, and Quebec, Canada; Jackman Maine; Rangeley Lakes, and then to Bretton Woods in the famous White Mountains of New Hampshire. The roads, with the exception of some stretches in Canada, are good. The return journey may be made by the way of Concord, N. H.; Boston, Worcester, and Springfield, Mass.; then to Lenox in the Berkshire Hills, down through the beautiful Housatonic Valley, across to Poughkeepsie, and down along the east shore of the Hudson River to New York. This route can be considerably shortened and many bad roads avoided by following directly up the west side of the river from Newburg through Kingston, Albany, Schenectady, Saratoga, Glens Falls, Ticonderoga, and Plattsburg to Montreal.

Taking a trip like this, which is one of the most attractive in point of scenic grandeur in the eastern United States, the itinerary can be laid out so that each day's run can be made easily and comfortably, allowing time for a noonday stop for luncheon, and confining the riding to daylight. The shorter trip could be made with ease in from two to three weeks, allowing plenty of opportunity to jog along easily, rest each Sunday, and enjoy the tour without hurry or bustle.

Palimpsest Brasses.

The reformation in England during the sixteenth century, and the wave of puritanism which followed, resulted in the destruction of much church furniture and ornament—in many cases amounting to complete plundering or destruction of whatever was valuable. Among other things memorial brasses were often stripped from old tombs, and it has been thought that this was due to general dislike to the form of record. But lately a number of palimpsest—or used over—brasses have been found in English churches, and their occurrence suggests that the destruction of old brasses did not follow religious scruples; but that the brass was taken up and sold, often to be turned over and the reverse side engraved in memory of some person recently buried. As the brasses are usually engraved with an effigy of the deceased person, and cut to the shape of the engraving, it would not always be possible to alter an ancient memorial; but often it could be done. A rarer form of adaptation was to use the brass without reversal, adapting the ancient effigy to the requirements of the time, crests or incongruous attire being cut away, and new details worked in to take their place.

In splicing a wire rope experience has shown that the efficiency of a splice depends on its length, the larger the rope the longer the splice required. In ordinary splicing of a ¾-inch rope, the length of the splice should not be less than 20 feet, for a 1-inch rope it should be 30 feet, and for rope over 1⅛ inches in diameter it should be 40 feet.



Cape Top and Folding Glass Fronts do Much to Keep the Car Dry and Comfortable in Rainy Weather.

HOW TO TOUR IN AN AUTOMOBILE.

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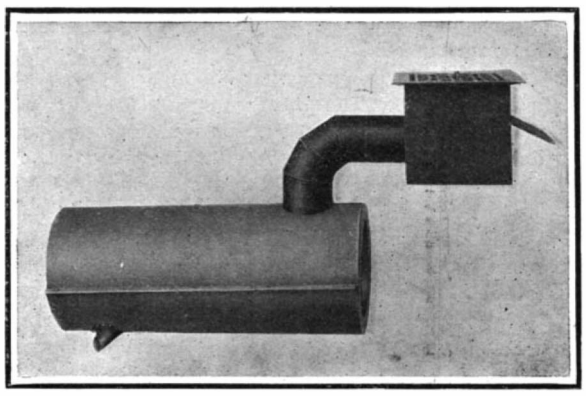
NOVELTIES

MOTOR CAR HEATER.

In cold weather the automobilist must wrap himself up into an unrecognizable bundle of fur in order to endure the chilled blasts produced by the rapid travel of his car, while beneath him is an engine that lives



HEATER FOR MOTOR CARS.

on fire, that is continually spitting forth hot gases, and that requires special appliances to prevent it from growing excessively hot. The incongruity of the situation has struck many a one, and efforts have been made to utilize the surplus heat of the engine to warm the occupants of the car. One method is to conduct the hot water from the water jacket to coils in the tonneau, and another method is to use the exhaust gases in a similar way. The accompanying engraving illustrates the latest development along this line. A jacket is fitted around the muffler, forming a hot-air chamber. The outside air is admitted into this chamber through a port in the forward end of the jacket, while at the opposite end the chamber communicates with a pipe that leads to a register in the floor of the car. The motion of the automobile provides the necessary draft, and the cold air entering the chamber is heated by the muffler, after which it passes through the register into the body of the car. When the register is closed, a shutter is opened, which permits the heated air to pass into the outside atmosphere. A heater of this class is best adapted for use in a closed car, although it can be used with some benefit in an open car. The makers claim to have heated a closed car with one of these heaters from a temperature close to zero up to 60 deg. F., in a few minutes.

AN AUTOMOBILE USED AS A HOISTING ENGINE.

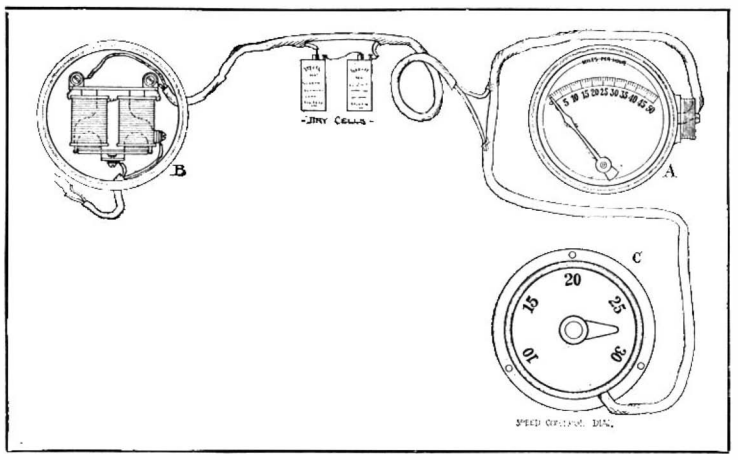
The novel use of an automobile shown in the accompanying illustration is but one more of the utilitarian purposes which such a machine can be made to carry out. The picture shows a standard double-opposed-cylinder, shaft-drive Maxwell runabout, one of the rear wheels of which has been removed and replaced by a windlass. The machine is being used as a hoisting engine for the purpose of raising men and materials to the upper story of the factory. This expeditious way of getting material directly into the building at the proper floor served to give the little car a very strenuous test, as the power had to be transmitted through the spur-gear differential, which was constantly in action while the windlass was turning, since the other wheel remained stationary upon the ground. Needless to state, the hoisting was done upon the low-speed gear, which also received a thorough testing.

THE NOVEL USE OF A MAXWELL RUNABOUT AS A HOISTING ENGINE.

AUTOMATIC SPEED GOVERNOR.

It quite often happens that the owner of an automobile who has every intention of obeying the speed laws is brought into court simply because his chauffeur has exceeded instructions. It is such a temptation to put on a little more speed than is allowed and the excess will hardly be noticed by the owner unless his eye is on the speedometer. Sometimes, too, the driver will unconsciously increase the pace of the machine because, after riding for some time, the same speed seems slower than it did at the beginning of the run. As a safeguard against such violations of the law an automatic speed governor has been devised which places the control of the machine directly in the hands of the man who is held responsible for its running. With this device the owner can set his machine to run at a predetermined speed and it will then be impossible for this speed to be exceeded.

The accompanying diagram illustrates the device and shows how it is operated. At *A* is a speedometer of standard type which is electrically-connected with a circuit-breaker, *B*, through the switch, *C*. The latter is provided with five or more contacts respectively marked 10, 15, 20, etc., to indicate the miles per hour at which the machine is set to run. The pointer of the switch may be turned to any one of these contacts. If, for instance, it be set at 15 miles, the machine may run at any speed up to 15 miles, but when this speed is reached the speedometer will automatically close the circuit through the switch contact 15 to the circuit-breaker *B*. This actuates the circuit-breaker through which passes the current to the primary of the induction coil, and thus cuts off the ignition current and shuts off the power. Another method is to have the circuit-breaker operate an electrically-controlled valve for shutting off the gas to the engine, when the car exceeds the speed at which the controlling switch was set. If the pointer on the controlling switch be set at an intermediate position, the device will impose no limits whatever on the speed of the car. In use the switch may be located within reach of the occupant of the tonneau or limousine, giving him entire control of the speed at which the vehicle may be operated and thereby permitting him to curb the recklessness of the chauffeur. By placing the control of the speed of a car entirely in the owner's hands, this device should add to the safety of those who employ chauffeurs.



AN AUTOMATIC SPEED GOVERNOR.

THE AUTO-SLIP ARCHIMÈDE—A PORTABLE APPARATUS FOR LIFTING AUTOMOBILES FOR EXAMINATION AND REPAIR.

A French patent has been granted to E. Huchet, of Nantes, for an apparatus called the "Auto-Slip Archimède," which is designed to facilitate the inspection, cleaning and repairing of automobiles. As will be seen from the illustrations, the device consists essentially of two wooden rails, shod and flanged with iron, which turn on bearings in two troughs or hollow tracks that are bolted to three cross pieces.

In the middle of the first cross piece there is a winch which is operated by a tangent screw and crank. The front ends of the rails are connected by a tie-rod, and the steel cable by which the car is drawn up on the rails passes over a pulley, carried by this tie-rod. One end of the cable is attached to a hook on a winch, the other to a sort of whiffletree, which is fastened securely to the axle of the car by two straps. Either axle may be used, but it is best to select the more heavily loaded axle.

The apparatus is portable and can be packed in a small space, as shown in Fig. 1. To reduce it to this form it is only necessary to take off the three cross pieces and the tie rod, and lay them parallel with the rails, each of which remains pivoted in its trough. Each end of the cross pieces and tie rod has three bolt holes, by means of which the width of the auto-slip can be adjusted to a car of any gage, from 1.20 to 1.40 meters (46¼ to 55 inches).

The nuts of the bolts have wings, and can be screwed on by hand. The parts having been assembled in this manner, props or wedges are placed under the front or short ends of the rails, and the car (with its lighter end in advance) is hauled up on the rails until it strikes the hoppers. The brakes of the car are then set firmly and all four wheels are strapped securely to the rails, care being taken to make a turn of each strap about a spoke. Then, the wedges having been removed, the continued operation of the winch has the effect of tipping the rails and the car, which can thus be placed in the most advantageous position for the examination and repair of any part of the chassis or mechanism. The wedges may be used, also, to support the rear or longer ends of the rails, as indicated in Figs. 3 and 2.

It is preferable, however, to attach the cable to the heavier end of the car and to stop hauling when the vehicle has nearly reached the position of equilibrium. In this method no wedges are required, and the car

(*Continued on page 339.*)

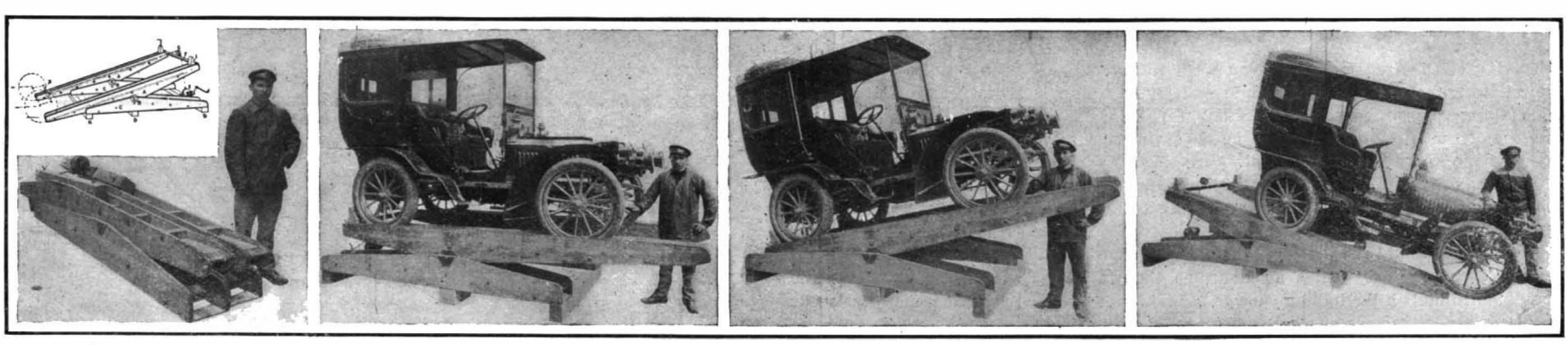


Fig. 1.—The Auto-Slip packed for transportation.

Fig. 2.—The Auto-Slip balanced horizontally to determine the position of equilibrium.

Fig. 3.—The Auto-Slip tipped to its maximum inclination.

Fig. 4.—The car leaving the Auto-Slip.

THE "AUTO-SLIP"—A NEW PORTABLE DEVICE FOR USE IN REPAIRING A MOTOR CAR.

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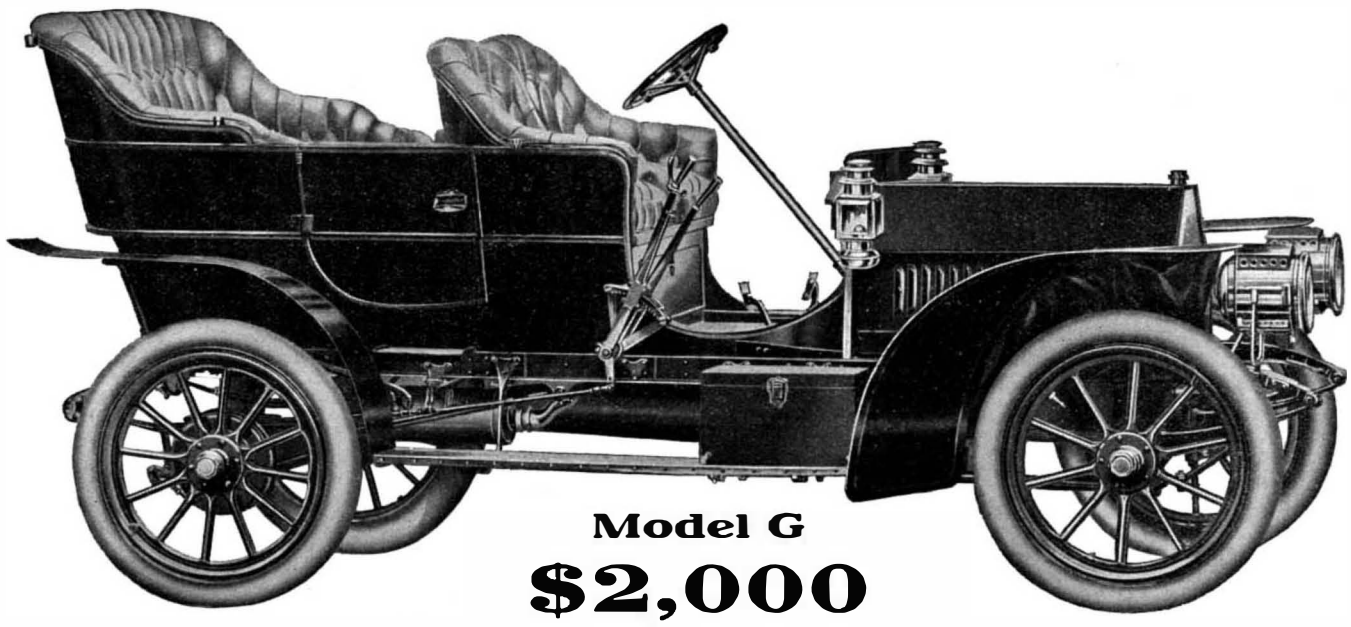


Model G

$2,000

Four-Cylinder—25 h. p.

Distinctively "Cadillac" Throughout—

Model G

CADILLAC

1908

This and All Models Now Ready

Judge Model G by performance, not price. On track, road and hill its superiority over cars of twice its price and thrice its rated power has been repeatedly demonstrated. There is noticeable simplicity in its design, with unprecedented efficiency at every point—speedy, powerful, flexible, silent, sensitive. Material and workmanship distinctively "Cadillac" throughout—a guarantee of the best in motor car construction. Has endurance to the limit of mechanical possibility.

Twenty-five horse power (A. L. A. M. rating); sliding gear transmission; shaft drive; 100-inch wheel base; surprising speed capabilities. $2,000 f. o. b. factory. Described in catalog G 47.

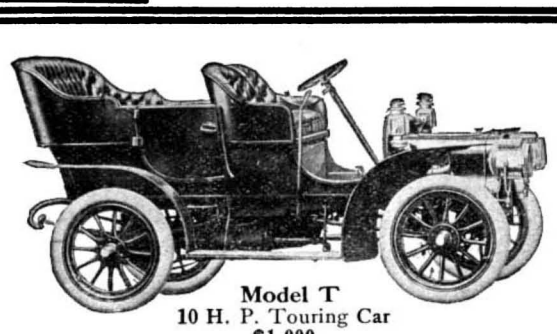
Among the other Cadi ac winners are the sturdy single-cylinder cars (Model S, Runabout, $850 and Model T, Touring Car, $1,000) and the luxurious four-cylinder Model H. The smaller types, as dependable and careful y built as ever, now have increased wheel base and longer rear springs, greatly adding to their easy riding qualities. Described in catalog T 47.

The Truth about the Automobile and What it Costs to Maintain One

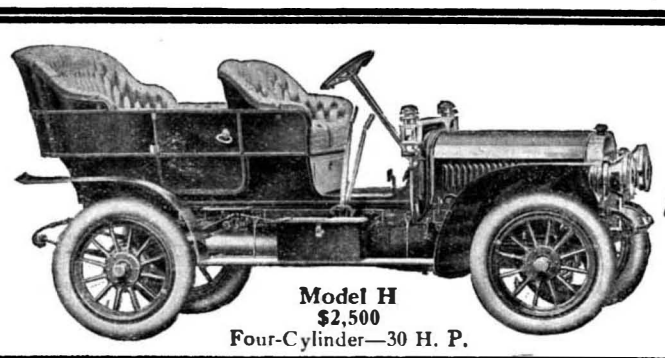
This is the title of a 64-page booklet compiled from sworn statements of a large number of users of single cylinder Cadillacs. Gives facts and figures which buyers want to know. Mailed free if you ask for Booklet No. 47.

Model H is an example of exclusive automobile designing and careful execution. Possesses that quietness, smoothness, abundance of reserve energy and luxury of riding which other makers strive to accomplish by a greater number of cylinders with consequent complications. A comparative demonstration will prove this. Thirty horse power, capable of 50 mi es an hour. $2,500 f. o. b. factory. Described in catalog H 47.

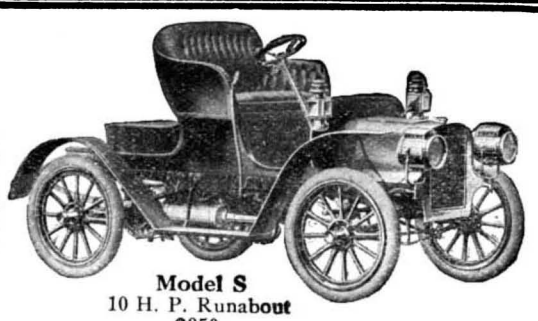
CADILLAC MOTOR CAR CO., *Member A. L. A. M.,* **Detroit, Mich.**



Model T
10 H. P. Touring Car
$1,000



Model H
$2,500
Four-Cylinder—30 H. P.



Model S
10 H. P. Runabout
$850

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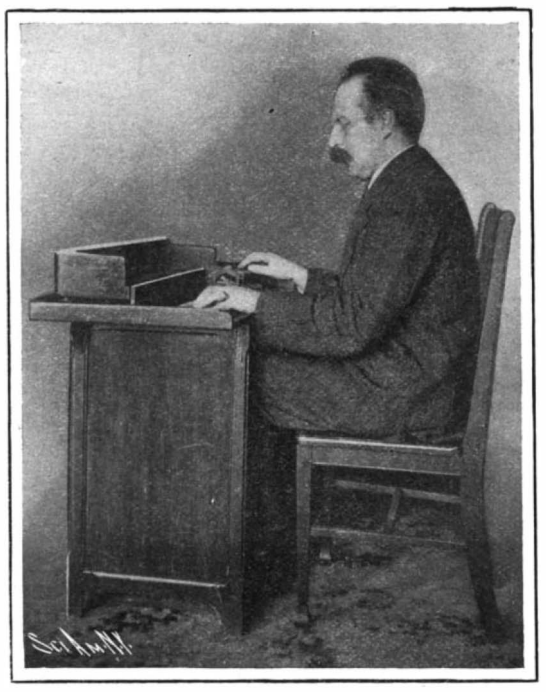
A NEW MUSICAL INSTRUMENT WHICH PRODUCES VIOLIN EFFECTS.

BY LOUIS J. STELLMANN.

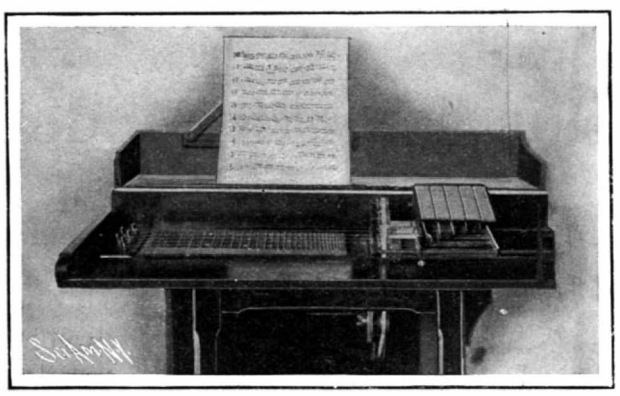
It is rather difficult to classify the musical instrument shown in the accompanying engravings. Like a cabinet organ it is played by operating a pedal, but as it is a stringed instrument it has no bellows. Like a guitar it is provided with strings of catgut stretched over a fretboard, but the strings instead of being picked by hand are vibrated by means of an endless moving tape. Probably its nearest analogue is to be found in the ancient hurdy-gurdy, the predecessor of the violin, which while similar to a violin in other respects, was played by means of a revolving wheel instead of a bow.

The harmochord, as the new instrument is called, was invented by Prof. Ferdinand Freytag, of San Francisco, with a view to producing violin effects in a simple manner. The instrument is provided with five strings stretched over a sounding board. The sounding board is mounted on a stand in the lower part of which is the operating pedal. By means of a series of pulleys above and below the strings an endless tape is led either up or down in close proximity to each string. This system of pulleys is set in motion by the pedal and the speed of travel of the tape is thus directly under the operator's control. Above the sounding board is a series of rollers which bear against the endless tape near the strings. These rollers are connected to a set of selecting keys at the right-hand side of the sounding board. There are five of these keys, and they serve to select the string which is to be sounded. When a key is depressed it causes its roller to press the tape against the corresponding string. The string is thus vibrated in a manner similar to the vibration produced by means of a bow. Several strings may be vibrated at the same time to permit of playing chords. The instrument is provided with a fretboard which assists the beginner in fingering the strings.

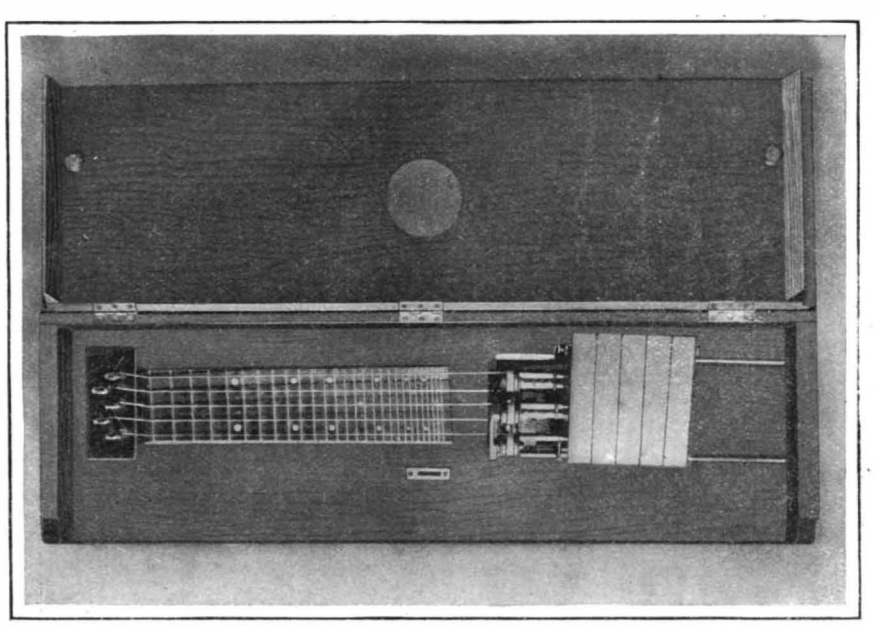
The quality of the tone produced by the harmochord can be varied by regulating the speed of the tape and the degree of pressure applied to the keys. To be sure it will produce only "straight bowing" effects, but its range is greater than that of the violin. The strings are tuned in the following order, beginning with the highest tone: E, A, D, F, and A. Its scope is four and a half octaves, and in its lower notes it resembles a 'cello. The inventor claims that with this instrument any one musically inclined may learn to produce violin effects with a proficiency and finish that would require many years of practice on the violin.



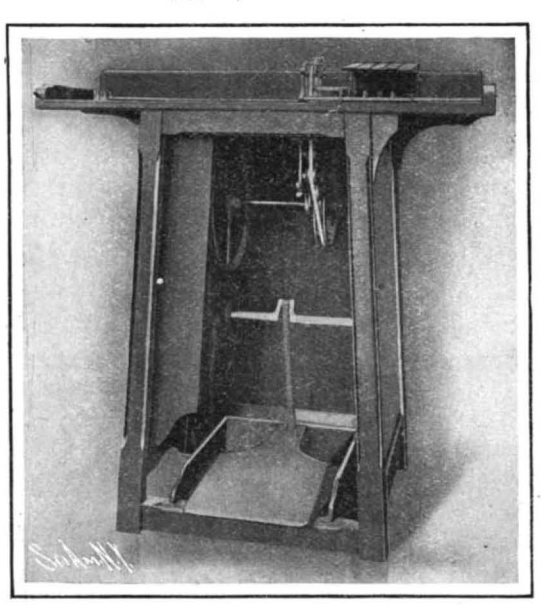
The Harmochord in Use.



General View, Showing the Finger Board and Selecting Keys.



Plan View, Showing the Selecting Keys and Rollers Which Press the Tape Against the Strings



The Pedal and Pulley System for Operating the Endless Tape.

A NEW MUSICAL INSTRUMENT WHICH PRODUCES VIOLIN EFFECTS.

The Introduction of Lapland Reindeer Into Labrador.

BY D. W. PROWSE.

Over the whole vast peninsula of Labrador both white men and the Eskimo have only one domestic animal, the Eskimo dog. Its only use is for transportation in winter. Years of training have made this savage beast into an admirable sledge dog, capable of performing marvelous journeys. All the time, however, he has remained a wild animal, as savage as a wolf. Every year one hears of his murderous attacks on human beings. Last winter, on a sledge journey which was protracted by blizzards, the pack of dogs fell upon their drivers, and devoured the whole family.

For over a year Dr. Grenfell, C. M. G., head of the Deep Sea Commission of Labrador, has been hard at work promoting the introduction of the Lapland reindeer into Newfoundland and Labrador, to supplant the treacherous dogs. The reindeer will furnish the Labrador population with food, both milk and meat, and splendid warm clothing, also with the very best means of transportation in winter. Anyone who knows about Sheldon Jackson's introduction of the tame reindeer into Alaska, and the splendid results achieved in that desolate country, can have no doubt about the like results at Labrador. The condition of both the country and the inhabitants is very much on a par. I have always declared that the tragedy of last winter should sound the death knell of the murderous Eskimo dog.

While the credit of this great move is due to Grenfell, it is only right that we should also give honor to those who have aided him. Foremost was the present governor of Newfoundland, Sir William Macgregor, G. C. M. G. He is well known to the world of science in connection with the School of Tropical Medicine. He took the keenest interest in the reindeer. With the assistance of the Moravian missionaries he made a collection of the Labrador mosses and lichens, so as to ascertain if they were the true indigenous food of the reindeer. There have always been wild reindeer in Labrador, and it was believed that the true reindeer moss could be found. The collection of mosses was sent to Kew, the headquarters of botanical investigation for the British Empire, and the authorities there certified that it contained all the varieties of the reindeer food. To make the project a success, it was felt that a herd should be brought over, two to three hundred reindeer, with Lapland herdsmen and their families. Grenfell on his round of lectures created such enthusiasm that the necessary money was soon contributed.

Mr. Wood, secretary of the Deep Sea Commission in London, put himself in communication with correspondents in Norway, and secured a herd of three hundred then on an island off the coast. After long negotiations and hard bargaining, a steamer was chartered for £1,500 to take the deer across. Through Sheldon Jackson, a Norwegian in western America was secured who was an expert in the business of transporting the reindeer. All was going well. Nansen, the Norwegian ambassador in London, was doing all in his power to favor the project, when a difficulty cropped up that seemed for the time insurmountable. The laws of Norway prohibited the exportation of reindeer moss, and without this special food the reindeer could not possibly be carried across the Atlantic.

Wood, the secretary, was for a time in despair, but through the influence of Nansen, the King of Norway, and our Foreign Office, the difficulty was smoothed over, and Wood is now in Norway, attending to all the details of the expedition, which sails early next month. Every care has been taken to secure the very best animals. 270 are does and 30 bucks; about 25 are thoroughly trained sledge reindeer for journeys. The best and most intelligent Lapland herdsmen, with a Norwegian interpreter, have been secured, and all will be under the control of Kjellman, a Norwegian thoroughly experienced in the business.

For the future management of the herd at Labrador, advantage will be taken of Sheldon Jackson's experience in Alaska. Settlers and Eskimos will associate with the Laps, and be taught how to manage the herds. To guard the animals from possible attacks by the savage Eskimo dogs, every precaution will be taken. It will be made first of all a condition that all dogs be destroyed around the place where the herds are located, as a prime condition before distributing the tame reindeer among the inhabitants. The deer are also guarded by the Lap herdsmen and their trained dogs. The caribou, especially the bucks, are fighting animals, and can strike fierce blows with their horns and hoofs. They would be quite a match for their savage assailants. It is anticipated that the Eskimos and settlers will soon learn how to take care of the reindeer, and to appreciate the immense advantages of securing such valuable domestic animals.

A Ballon-Sonde at 84,624 Feet Altitude.

According to an interesting report in Petermann's Mitteilungen, a ballon-sonde, or "sounding balloon," has been launched from Strasburg to a height of 16 miles. The altitude generally reached by balloons seldom exceeds 11¼ miles.

The phenomena as regards the temperature and moisture of air recorded during this ascension consist of a regular reduction of temperature until —62 deg. C. at a height of 9 miles, after which a regular heating through a thickness of up to 6 miles is observed in higher altitudes.

According to a note recently published by R. Dongier in the Revue Scientifique, there would be a relatively hot layer, being the isothermical zone which corresponds to an altitude variable between 26,246 and 39,370 feet. There are generally in the atmosphere two main layers, which are strictly different as regards their thermical and hydrometrical properties. Whereas in the lower stratum the temperature and moisture undergo a reduction more or less rapid (according to altitude), such changes are of feeble intensity in the upper stratum, in which the atmosphere can be considered as made up of a number of thin layers, the temperatures of which would vary slightly either in one direction or another, thus determining changes in the speed and direction of winds. The lower stratum would on the contrary be affected by heavy vortices, cyclones, and atmospheric depressions.

Much trouble is caused in brazing by not using thoroughly fused borax. Dry borax does not answer, as it swells while brazing, and makes the joint porous. It should be melted in a clay or iron crucible to a clear liquid so as to drive off all water. Such borax will not swell when used for brazing.

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INDEX OF INVENTIONS

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October 29, 1907.

AND EACH BEARING THAT DATE

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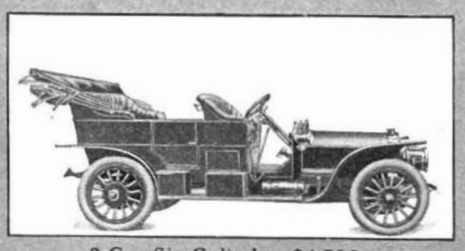
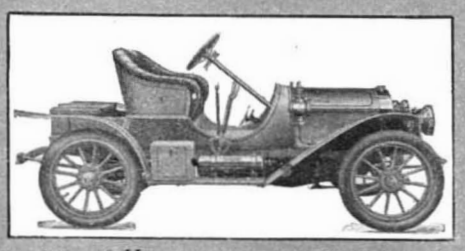
Stoddard-Dayton

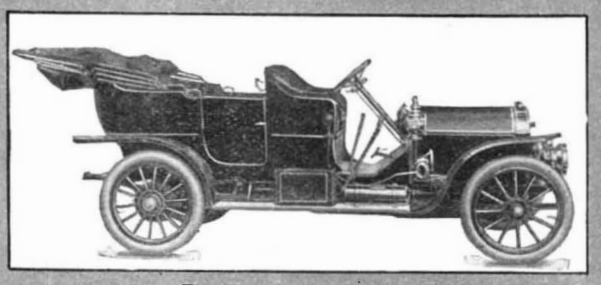
1908 MODELS



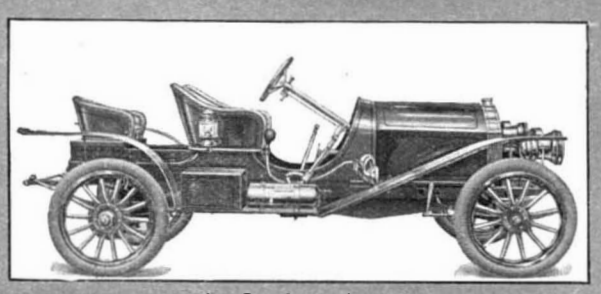
8-G. Six-Cylinder, $4,500
Complete. Without Top



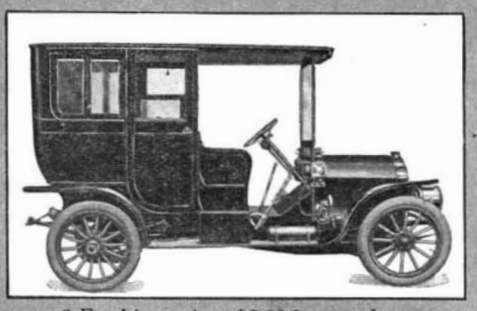
8-H. Runabout, $1,700
Complete. Without Top



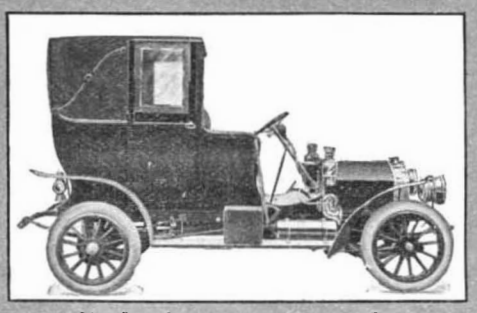
8-F. Touring Car, $2,500
Without Top or Gas Lamps



8-K. Roadster, $2,500



8-F. Limousine, $3,500, complete



8-N. Landaulet, $2,500, complete

SEND FOR 1908 CATALOG

THE DAYTON MOTOR CAR CO.
DAYTON, OHIO, U.S.A.

Stoddard-Dayton

Contact shoe, third rail, S. B. Stewart, Jr. 869,465
Control system, L. M. Aspinwall 869,824
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Dental impression pliers, M. A. Robbins 869,520
Display easel, J. E. Twitchell, reissue 12,711
Display rack, R. L. Wilcox 869,608
Door lock, pocket, J. J. Baxter 869,541
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Electric currents, transformation of, W. T. Taylor 869,595
Electric furnace, G. Gin 869,432
Electric heater, G. E. Stevens 869,464
Electric heating fabric, W. Richmond 869,460
Electric machines, series shunt for dynamo, E. T. Mug 869,796
Electric motor, J. P. Hayes 869,780
Electric regulator, A. H. Barber 869,684
Electrical apparatus, T. W. Varley 869,602
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Engines, ignition system for explosion, R. Varley 869,601
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Fastening clamp, S. I. Feinberg 869,236
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Fluid pressure brake, G. Westinghouse 869,606
Fluid pressure motor, S. Otis 869,453
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Furnace, T. S. Blair, Jr 869,616
Furnace, J. & J. R. Eynon 869,698
Furnace attachment, B. F. Herr 869,434
Furnace door, C. J. F. Johnson 869,575
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Gas generator, W. M. Cross 869,232
Gas generator, acetylene, J. Magreth 869,719
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Gas making apparatus, L. P. Lowe 869,582
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Glassware, machine for making hollow, S. E. Winder 869,538
Globe manipulator, J. Gaynor 869,836
Grading machine, C. D. Edwards 869,354
Grading machine, G. W. Barnett 869,408
Grain door, H. H. Boenker 869,412
Grain drill cleaner, R. M. Richards 869,730
Grain milling apparatus, G. E. Chamberlain 869,622
Grass catcher, J. H. Coult 869,349
Grinder, mower knife and tool, J. M. Ross. 869,734
Hammer nail holding attachment, G. W. Fowler 869,835
Hand-hole cover, K. Park 869,327
Harness attachment, draft, W. E. Perry ... 869,803
Harrow attachment, E. Schultz 869,660
Harrow, pulverizer, and drag, combination, A. D. Ulery 869,756
Harrow tooth, L. W. Fair 869,299

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ELECTRIC INCUBATORS.

One of the latest applications of electricity is in the construction of electric incubators and poultry-breeding apparatus. While artificial processes have for some time past been in use, in connection with poultry breeding, they have been based on the use of compartments heated by gas, alcohol, or petroleum. The apparatus here described is, however, heated and regulated directly by electric current as derived from the mains, any complicated accessories being dispensed with.

The electric incubator shown in Figs. 1 and 2 has been designed by Mr. G. Kesel, of Kempten, Bavaria. In Fig. 2, which shows the apparatus opened, a wire mesh may be seen on the lid. Back of this the main radiator is arranged which takes up the whole of the lid, and which is worked only as long as the apparatus is kept closed. As the heating wires are strung out uniformly throughout the lid, all eggs are submitted to the same heating effect, regardless of their location in the drawer. The main heating body in the lid of the apparatus is assisted by auxiliary radiators placed on the bottom of the outfit, which are continuously energized even while the apparatus is opened, maintaining the hatching compartment at a uniform temperature of about 30 deg. C. (86 deg. F.) and preheating the air entering the hatching compartment.

The heating coils of the apparatus are energized as soon as the contact is connected to the mains. The temperature is controlled by the automatic switch of the main radiator and the heat regulator in the hatching compartment. Supposing a temperature of 39.5 deg. C. (103 deg. F.) to be required in the hatching compartment, the apparatus is heated until this temperature is recorded by the thermometer, after which the contact is thrown out by turning a screw fitted outside the apparatus. After a little adjusting of the screw a point will be reached at which the temperature in the hatching compartment is kept accurately at 39.5 deg. C. (103 deg. F.) when even during several months' operation fluctuations in the hatching temperature will be less than one-tenth of a degree, the mercury of the thermometer remaining most constantly at the point of adjustment. Whether the adjustment has been properly made, may be determined by the uniform ticking motion of the switch. This uniformity of temperature is obtained by the automatic switching in and out of the main radiator in the lid of the apparatus. While the auxiliary radiators, as above mentioned, will raise the apparatus to a temperature of about 86 deg. F., the main radiator supplies the surplus heat, being thrown alternately in and out of circuit by means of the switch at a rate depending on the temperature.

One of the most difficult features of artificial poultry breeding is a proper supply of fresh air. In the electrical incubator air is supplied from underneath, the entering fresh air coming in contact with the eggs after being properly pre-heated by special radiators. This ventilation is controlled by opening to a variable extent the lateral slides fixed at the top of the apparatus. When working in a heated room, the slides should be obviously opened to a greater extent than in a cold room. It should be remembered that ventilation plays the role of maintaining the life of the germ. While an ample supply of fresh air therefore is extremely valuable for the development of the germ, any excess of ventilation will prove detrimental; in fact, the surplus air will exert a drying action on the contents of the eggs. Nevertheless, it will be found more advantageous to have too much ventilation than to risk killing the germ by stifling.

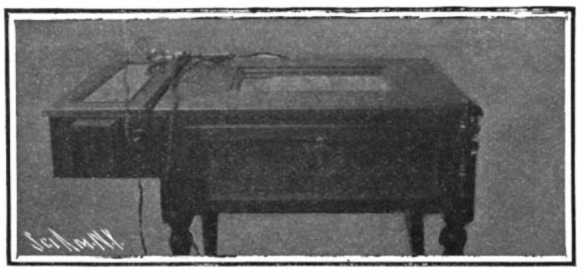

Fig. 1.—The Incubator Closed and in Operation.

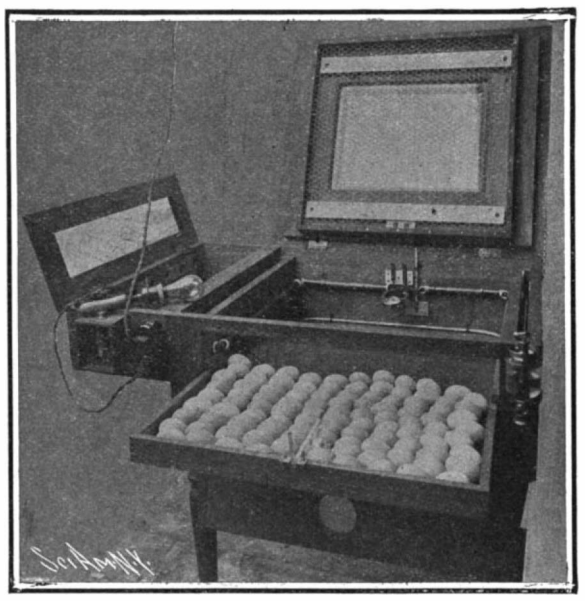

Fig. 2.—The Apparatus Open, Showing the Manner of Holding the Eggs.

The incubator is provided with two thermometers, one of which is arranged in front in the drawer containing the eggs, and the other in the interior of the hatching compartment. The former is observed through a glass window from the front, when the apparatus is closed, while the other thermometer is read from above through the double window in the lid of the apparatus. Both thermometers can be placed at the same height; and after adjusting for the desired temperature by means of the front thermometer, the other thermometer is displaced until the temperature recorded by it is exactly the same. A better practice, however, is to so arrange the second thermometer as to have it record one degree more than the front thermometer. The second thermometer, located in the hatching compartment, serves as an emergency safeguard. Should the heat regulator fail to work, this thermometer will regulate the temperature in its turn by throwing the main radiator out of circuit.

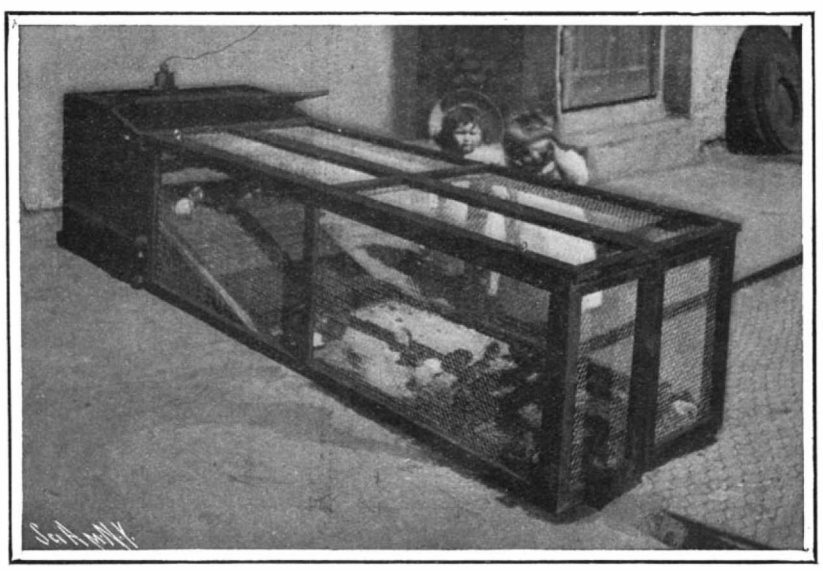

Fig. 3.—The Apparatus Used as a Brooder After the Birds are Hatched.

A much-discussed point in connection with artificial poultry breeding is the supply of moisture. The constructor of this apparatus recommends using no artificial supply of moisture, the necessary amount being always provided by a proper ventilation. Nevertheless, the construction of the apparatus allows of any amount of moisture being supplied from outside, the degree of moisture being read from a special hygrometer.

Below the contact supplying the heating current, another contact box has been arranged for an incandescent lamp, which apart from lighting the apparatus, whenever required, serves for observing the actual condition of the eggs, any motion of the embryo being readily watched in the semi-transparent eggs, while foreign bodies in infertile eggs are detected. The operation of the incubator is so uniform that the time of hatching of all eggs of a given batch is about the same, the maximum difference being two to three days.

As soon as they are hatched the chicks are moved to a compartment in which they are kept for 24 hours without food. From this compartment they are taken to the electric breeding apparatus represented in Fig. 3. This is separated into two portions, one of which serves as a sleeping chamber and the other as a feeding room.

The most important feature of the electric breeding apparatus is the heating plant, which can readily be connected to the ordinary lighting circuit. The radiator of the sleeping compartment is fitted to the ceiling, and is so designed as to produce a uniform radiation of heat from the ceiling, thus preventing any crowding of the chickens. Three different degrees of heat can be obtained by actuating a switch, the temperature being made to decrease from day to day. The requisite heat depends on the number of chicks contained in the apparatus.

In the United States inventors have been successfully at work in this direction, and electric installations may be obtained to fit into existing oil incubators. A very ingenious adaptation has been worked out with a view to illustrate the hatching of chickens in nature classes or schools. This device is known as the "Electrehen"; an oval glass incubator, operated by the heat of an electric incandescent lamp, controlled by a delicate and sensitive thermostat which holds the temperature steadily at 103 deg. F.

The "Electrehen" has a neat metal base of ornamental design, with nickel-plate, oxidized copper, or gun-metal finish, the base forming the brooder for the newly-hatched chicks. A drawer is provided, which is partly drawn from the base, and the chicks run about in the fenced inclosure, about three or four feet square, making a most interesting exhibit.

This most attractive device is easily connected to any electric lighting circuit, either alternating or direct current, of 110 volts, by the usual flexible cord and plug. It is only necessary to turn the button, and sufficient heat is provided for hatching and brooding the chicks.

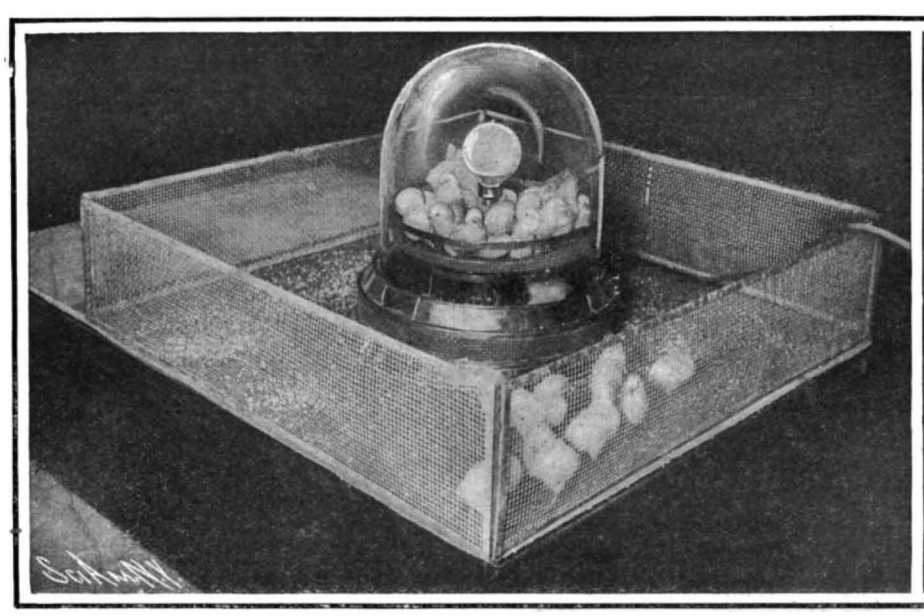

Fig. 4.—The "Electrehen," Showing Chicks Under Glass Dome.

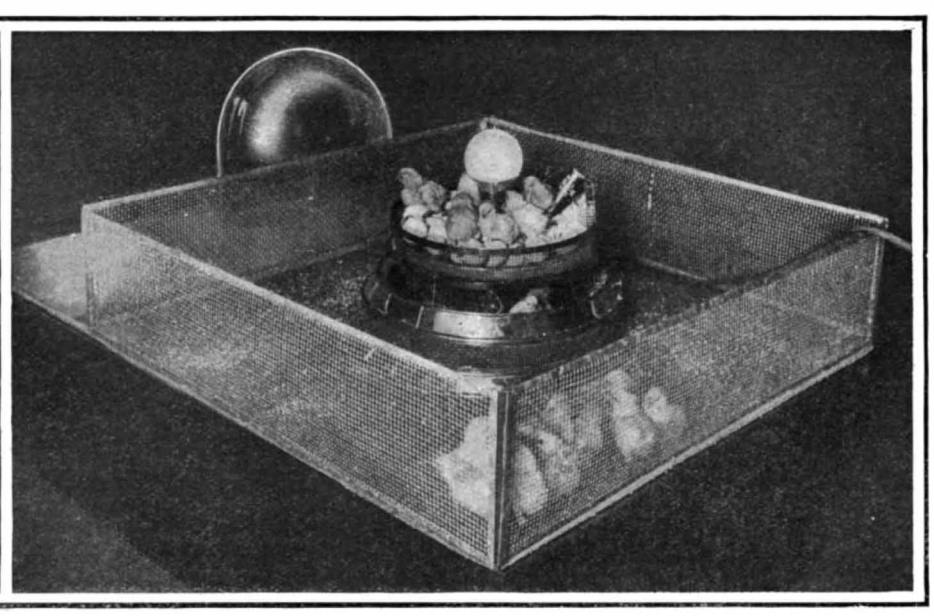

Fig. 5.—Eggs and Newly-Hatched Chicks in the "Electrehen."

ELECTRIC INCUBATORS.

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Harvester, beet, Heilig & Reed, reissue.... 12,708
Harvesters, counting mechanism for grain, W. H. Crane.... 869,424
Hat, coat, and umbrella rack, G. W. Hartman 869,779
Heading machine, H. A. Powers.... 869,516
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Heat, reducing compounds with electrically developed, F. J. Tone.... 869,276
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Hinge, C. W. Cook.... 869,553
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Horseshoe calk, J. M. McKnight.... 869,590
Horseshoe calk, removable, A. E. Rehrig.. 869,330
Hose or pipe coupling, C. F. Snyder.... 869,662
Hose supporter, E. Pearl.... 869,457
Hub, sand-proof disk, E. L. Black.... 869,226
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Insulating coupling, A. W. Berresford.... 869,410
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Insulator, strain, A. Anderson.....869,403, 869,404
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Land roller, J. Wolfinger.... 869,676
Lantern, electric, F. P. Cobham.... 869,550
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Laundry iron, J. R. Adams.... 869,679
Letter box, W. H. Hushour.... 869,844
Lineman's safety device, W. F. Newton.... 869,382
Liquid cooler, J. D. Spencer.... 869,745
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Liquids from vapors, apparatus for separating, Aitken & Mackie.... 869,680
Loading apparatus, F. M. Hogg.... 869,569
Lock, W. H. Taylor.... 869,533
Locomotive boiler, S. A. Reeve.... 869,805
Locomotive tank siphon, C. W. La Rue.... 869,854
Loom shuttle, W. L. Hall.... 869,778
Loom stop-motion mechanism, faller for, Whitney & Ecaubert.... 869,819
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Measuring speed of rotation, apparatus for, W. D. Litchfield.... 869,442
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Micrometer screw gage, Eilhauer & Ruckert 869,697
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Molding machine, crayon, Daniel & Keller.. 869,692
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Mowing machine, W. Oster.... 869,799
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Necktie fastener, Balla & Stein.... 869,683
Nest, trap, H. P. Rankin.... 869,263
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Oil can, S. E. Friend.... 869,702
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Packing, stuffing box metallic, J. C. W. Weber 869,536
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Paper, protecting commercial, E. E. Angell. 869,823
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Pipe fitting, A. C. Walworth, Jr.... 869,340
Pipe seaming machine, C. H. Gervers.... 869,704
Plane, J. H. Shaw.... 869,267
Plaster slabs for building, etc., making wooden cored, G. S. Mayhew.... 869,638
Platen shift mechanism, G. W. Campbell.. 869,347
Plow harrow attachment, J. C. Fooshe.... 869,834
Plow, reversible disk, Mallory & Slaughter. 869,499
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Plow standard, adjustable, W. P. Wigley.. 869,341
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Pump, measuring, C. S. Jones.... 869,246
Pump, measuring, F. C. Wilson.... 869,469
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Railway frog, T. F. Donahoe.... 869,695
Railway rail joint, T. B. Cheek.... 869,479
Railway safety device, inclined S. E. Jackman 869,847
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Railway tie, M. J. Nolan.... 869,645
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Railway train safety mechanism, J. Doyle. 869,557
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Railway trains, controlling apparatus for, J. T. Thompson.... 869,598
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Razor, safety, J. J. Steinharter.... 869,748
Receptacle, L. J. Sheperd.... 869,334
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Resistance unit, C. Macmillan.... 869,314
Riprap, F. W. Hawkes.... 869,566
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Rock drill feed mechanism, T. Turner.... 869,278
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Rolling black plates or sheets, C. W. Bray. 869,292
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Rotary engine, Tippett & Reece.... 869,397
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Rubber, artificial, W. H. Brownlow.... 869,618
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Rule or calipers, G. W. Le Compte.... 869,578
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Safe, J. M. Allen.... 869,220
Safe door support, J. M. Allen.... 869,221
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Sandpapering machine, J. Black.... 869,688
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Sash fastener, G. A. Orr.... 869,798
Sash holder, T. N. Jones.... 869,437
Saw, W. B. Huther.... 869,574
Saw guard, F. C. Pfeil.... 869,513
Sawmill feed, R. L. Woodruff.... 869,821
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Separator bowl, centrifugal, P. B. Shee.... 869,803
Sewage sludges, treatment of, F. M. Spence, et al.... 869,272
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Sheep shearing machine, T. A. Martin.... 869,500
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Sign, electric, W. Wallace.... 869,468
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Siphon, alternating, R. C. De La Hunt.... 869,482
Slat-operating mechanism, B. Albertson.... 869,473
Sled, L. Therriault.... 869,596
Sling, H. Oehrmann.... 869,325
Slot machine, J. P. Munch.... 869,254
Solder feeding mechanism for canning machines, N. Nelson.... 869,510
Solder for aluminium, T. T. Hosack.... 869,570
Sole or heel, shoe, J. H. Vinton.... 869,603
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Spark plug, A. Holsten.... 869,865
Speculum, mouth, J. F. Koehler.... 869,439
Speed-changing mechanism for hydro-extractors, H. Hott.... 869,782
Spinning or twisting frames for top rolls, traveling guide for, L. T. Houghton... 869,571
Split switch, G. M. Ervin.... 869,298
Spooler, A. E. Roades.... 869,519
Spring roller, J. H. Sweetland.... 869,396
Sputum cup, H. J. Potter.... 869,515
Sputum cup, C. W. Meinecke.... 869,793
Squares, machine for rolling carpenters', H. K. Jones.... 869,850
Stable equipment, J. Von der Kammer.... 869,715
Stair rod fastener, W. H. Joyner.... 869,492
Stamped fabric, C. E. Bentley.... 869,225
Stay log, E. F. Smith.... 869,270
Steam conduit, Aylsworth & Dyer.... 869,763
Steam generator, H. Cox.... 869,829
Steam generators, automatic stoker for, J. Hodgkinson 869,708
Stereotype plate holder, J. S. Weyl.... 869,607
Stoker, mechanical, D. A. Wood.... 869,539
Stool or seat, adjustable, W. C. Hahne.... 869,777
Stoves, etc., auxiliary fuel box for, T. B. Lockley 869,581
Strainer, M. Hancock.... 869,433
Strap fastener, G. A. Mains.... 869,866
Superheater, M. Toltz.....869,600, 869,669
Swaging mill, E. Winter.... 869,284
Swing, veranda, Till & Newton.... 869,753
Table game attachment, C. J. Knudson.... 869,718
Talking machine stop mechanism, J. C. Stuckey 869,749
Tanning compound, H. M. Murray.... 869,723
Telegraph pole, fence post, and the like, H. Miller 869,252
Telegraph, printing, B. W. Cochran.... 869,420
Telegraphy, wireless, W. S. Hogg.... 869,634
Telephone lines, measured service system for, J. L. McQuarrie.....869,449, 869,450
Telephone receivers, adjustable support for, R. Higgins 869,368
Telescope, L. Bell.... 869,769
Telescope, sight, F. Schleth.... 869,395
Thermal protectors, automatic resetting and testing means for, F. B. Cook.... 869,864
Thill coupling, A. F. Warele.... 869,758
Tie. See Railway tie.
Tile, J. F. Schwartz.... 869,266
Tile, H. Haugh.... 869,362
Timber framing machine, Peters & Clarkson 869,646
Tongue switch, E. Lewis.... 869,580
Tool chest handle, H. Cowan.... 869,423
Tool, combination, A. Weber.... 869,759
Tool, machine, F. Muller.... 869,588
Tool or utensil, combination, J. R. Hamilton 869,706
Toothpick machine, W. F. Hutchinson.... 869,573
Toy, advertising, J. Bauno.... 869,686
Toy badge, J. J. Meehan.... 869,792
Train protecting device, automatic, E. Unverricht 869,398
Transformer, steam, S. Otis.... 869,454
Transmission device, O. & H. Matthei.... 869,501
Trap, L. A. Cornelius.... 869,625
Trees, grafting, P. Keiser.... 869,493
Trolley, S. D. Hunt.... 869,711
Trolley head for electric traction, Holmes & Allen 869,843
Truck, brick, H. J. Dundas.... 869,353
Truck, motor railway, S. Otis.... 869,456
Truck construction, car, O. S. Pulliam.... 869,652
Truck side frame, car, H. C. Buhoup.... 869,416
Truck wheel, G. F. Armstrong, Jr.... 869,767
Tube cutter, F. Fleming.... 869,628
Tubes, manufacture of, A. E. Beck.... 869,476
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Tubulating machine, J. T. Fagan.... 869,428
Tug, hame, A. E. Sutton.... 869,813
Tunnels, ventilation of, S. C. Davidson.... 869,297
Turbine, reversible elastic fluid, C. W. Dake 869,773
Typewriter machine, D. Briggs.... 869,826

To the Technically Well Informed Man

The New Model D, 24 H. P.

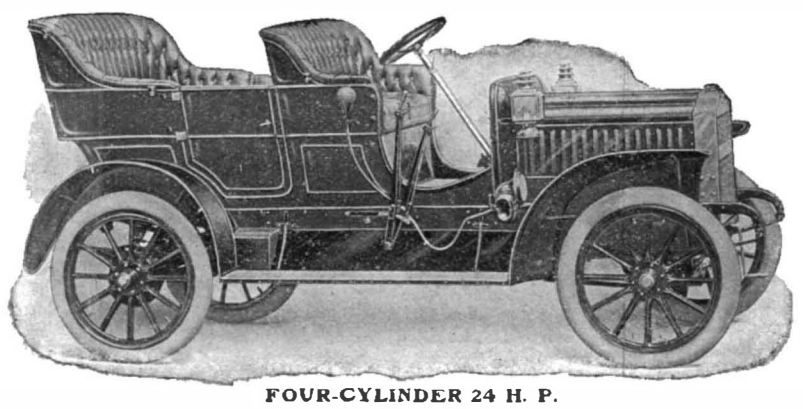
"Maxwell"

$1750

presents the only logical solution of the problem of a four-cylinder car at moderate price.

What this car is and does, as to durability, economy and performance, is indicated by the fact that it is an exact duplicate in mechanical principles of the famous four-cylinder "Maxwell" which won the Deming Trophy in 1906, and served as pilot in the 1907 Glidden Tour.

Those "Maxwell" owners who have wanted a higher-powered car, and those to whom a four-cylinder car has heretofore seemed an extravagant luxury, will rejoice at the arrival of this new model.



FOUR-CYLINDER 24 H. P.

SPECIFICATIONS

MOTOR—Four-cylinder vertical, cylinders cast separately.
TRANSMISSION—Sliding gear, progressive type.
CLUTCH—Multiple disc.
DRIVE—Shaft.
FRAME—Pressed steel, channel section.
LUBRICATION—Positive forced-feed.
IGNITION—Jump-spark; current supplied by dry cells and storage battery.
SPRINGS—Semi-elliptic.
CARBURETOR—Float-feed, giving perfect mixture at all speeds.
COOLING—The "Maxwell" thermo-siphon system of water-cooling.
BODIES—Sheet metal, upholstered with fine quality leather and hair.
WHEEL-BASE—96 inches.
WEIGHT—2100 pounds.
EQUIPMENT—Three oil lamps, tools, horn, etc.

This car is the result of the efforts and genius of Mr. J. D. Maxwell, whose pre-eminence as a designer of gasoline cars is acknowledged throughout the automobile world. Mr. Maxwell spent the entire past year in perfecting this model, and continually refused, in the face of a strong demand, to allow it to be put on the market until it had met with his approval in every detail.

I want you to prove this car to yourself.

Write to me personally and I will see that you get a demonstration. Address Dept. 42.

Benj. Briscoe *President.*

MAXWELL-BRISCOE MOTOR CO.

70 Spring Street, Tarrytown, N. Y.

Factories: CHICAGO, ILL., PAWTUCKET, R. I., NEW CASTLE, IND.

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THE AERO CLUB TROPHIES AT THE AUTOMOBILE SHOW IN THE GRAND CENTRAL PALACE.

THE SCIENTIFIC AMERICAN FLYING MACHINE TROPHY.

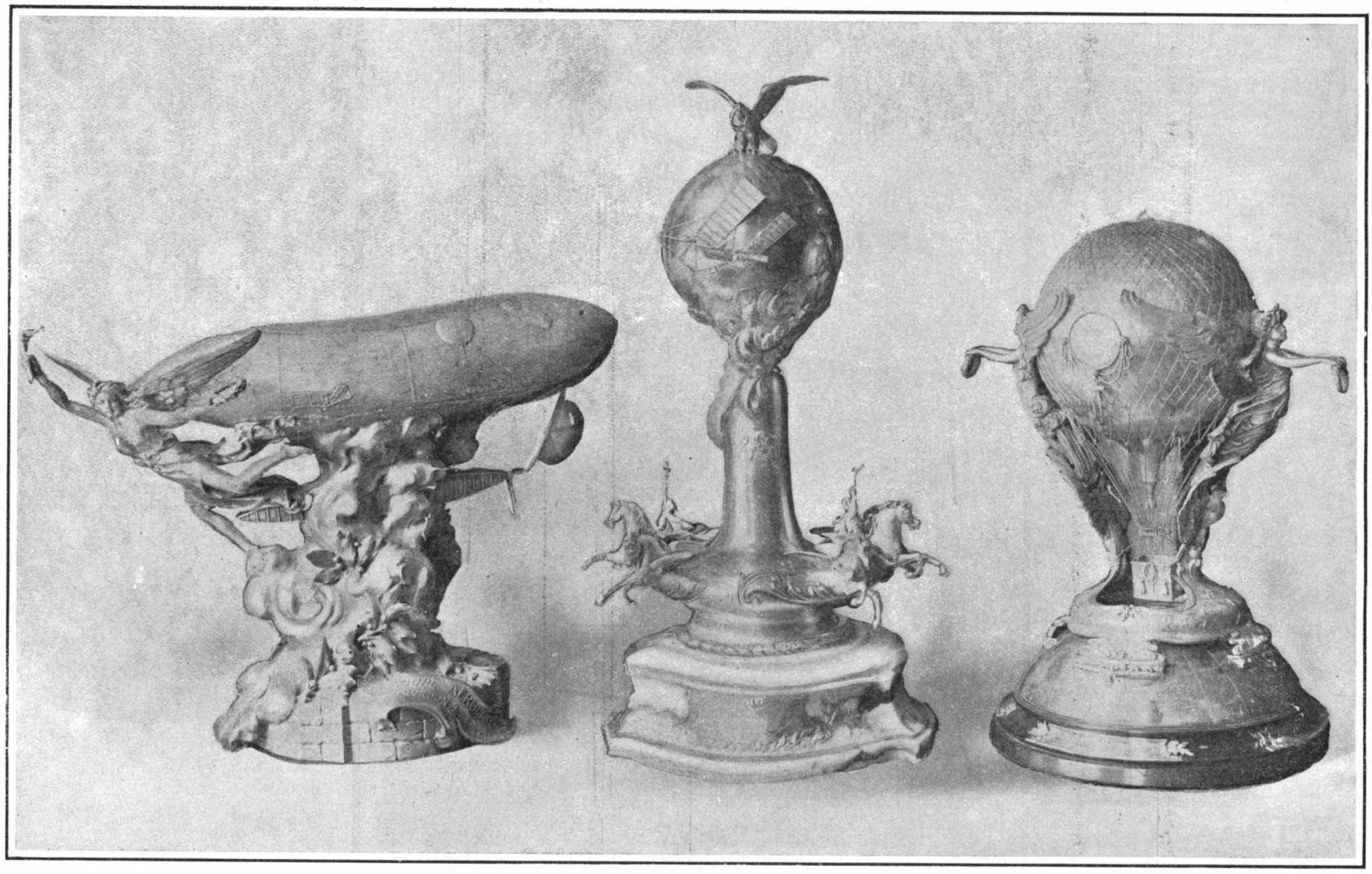
In presenting this trophy to the Aero Club of America the publishers of the SCIENTIFIC AMERICAN have recognized that the conquest of the air may not come through dirigible gas bags, but through the perfection of aeroplanes, machines which are heavier than air. The cup is offered for competition among the heavier-than-air machines and, year by year, as aeroplanes are developed, the conditions governing the contest will be readjusted. The cup stands 32 inches high and is a magnificent trophy of wrought silver mounted on a pedestal of onyx. At the base of the pedestal-shaft, graceful winged silver horses spring forth ridden by figures bearing olive branches. The shaft is surmounted by a whirlwind bearing a globe representing the firmament. On one side of the globe is the American continent, while on the other an aeroplane soars through the clouds, challenging the swallows in their flight. The whole is crowned by an American eagle, bearing a wreath of victory. The cup is of American manufacture and is valued at $2,500.

THE GORDON BENNETT INTERNATIONAL CUP.

The Gordon Bennett cup was offered in 1906 as an international trophy for long-distance balloon races. At the initial contest one American balloon piloted by Lieut. Lahm was entered, and bore off the coveted trophy against fifteen competitors. The cup is a fine example of the silversmith's art and was modeled in accordance with suggestions made by the donor. The design represents a dirigible balloon, supported by clouds, and led in its course by a winged figure bearing in one hand the torch of science, and in the other a wreath of victory. On the body of the dirigible balloon, on one side, spherical balloons are shown high in the air and an aeroplane begins its flight. On the other side are shown a parachute and two Montgolfier balloons. The cup was constructed in Paris at a cost of $2,500.

THE LAHM AERONAUTIC CUP.

On the receipt of news that Lieut. Lahm was bringing the Gordon Bennett trophy to America, the Aero Club of America decided to commemorate the victory by offering a cup for distance contests. As the SCIENTIFIC AMERICAN and the Gordon Bennett trophies suggest aeroplanes and dirigible balloons respectively, so this one honors the spherical gas-bag, the lineal descendant of Montgolfier's balloons. This feature is a faithful reproduction of a balloon, supported lightly by the wing tips of two female figures whose outstretched hands hold wreaths of victory. The lower limbs of the figures blend into the outstretched wings of supporting eagles, perched on small spheres rising from a firmament of stars and planets. Below is a portion of the northern hemisphere, which rests on an ebony base set with silver plates to bear the names of the winners of the trophy. The cup was made in New York at a cost of $1,500.



The Gordon Bennett International Cup. The Scientific American Trophy. The Lahm Cup.

THE AERO CLUB TROPHIES AT THE AUTOMOBILE SHOW IN THE GRAND CENTRAL PALACE.

The Prevention of Fire at Sea.

The recent alarming fire on the steamer "Fortunatus" shows again the insufficiency of the methods adopted on most vessels to protect themselves against such an outbreak. A good fire appliance has not only before it the task of subduing a fire, but specially of saving the cargo from being damaged by water. In many cases after the fire has been finally extinguished, it has been found that the water damage far exceeded the damage by fire. It is therefore obvious that an ideal fire appliance can only be of a purely chemical nature.

It is not only the prevention of water damage which tells so much in favor of the use on board ship of a chemical fire protection. There is another reason, well known and feared in shipping circles, viz., that a fire cannot always be extinguished in certain goods, especially in cotton bales. Such a cargo is not only easily combustible, but a fire in it cannot readily be checked, the water acting, as it were, as a source of oxygen. A gas, moreover, permeates all the small channels of woolen fibers which water is unable to reach. Similarly, water cannot extinguish a fire on an oil steamer, although it is easy work for a chemical fire appliance to do so.

Among the chemical fire appliances now in use at sea may be mentioned that known as the "Gronwald" system. It consists, briefly stated, of an apparatus through which carbonic acid gas is passed into perforated pipes, which are so fixed in the hold as to allow a good distribution of the gas. The gas is carried in the ordinary steel cylinders that are used for refrigerating plants on board vessels, the number of the cylinders depending on the size of the ship. From the steel cylinders the gas passes into the apparatus, where it expands before entering the pipe system in the compartments. To facilitate the flow of the gas, steam from the ship's boilers is let through a special arrangement of the apparatus. Each hold can be worked independently, the apparatus recommended for ordinary steamers and sailing ships of any size being portable. For its operation no machinery is required, the gas working under its own pressure. The steam passing through the apparatus is merely for the purpose of heating the latter to aid in the expansion and flow of the CO_2 gas, and to prevent the formation of snow. The "Gronwald" system is not a gas-generating plant requiring special skill for its operation. The gas is always ready for instant use, and this is obviously a very important point.

The "Gronwald" CO_2 system is, above all, adapted for the prevention of spontaneous combustion and ignition. As soon as the air in a hold reaches an abnormally high temperature several bottles of liquid CO_2 can be discharged into the hold in order to displace the air from it, so cutting off the supply of oxygen, the source of every outbreak of fire. At the same time the liquid CO_2, which has been so far in a liquid state, will evaporate rapidly and deprive the surroundings of its heat, thus lowering the temperature in the hold by 30 deg. and more—a point in its favor which, it is stated, no chemical fire appliance except the CO_2 system can claim. Another virtue of the CO_2 gas is that it is a thoroughly neutral gas. It does not affect the most delicate cargoes, as those of silk, tobacco, and wine. This is contrary to the action of most other chemicals, which damage many such cargoes and also the fittings of the ship if they happen to be wet or moist. The last state of that ship may be worse than the first under such conditions.

For fire extinguishing purposes it is not necessary absolutely to fill up the hold with CO_2 gas, but the admixture of a certain percentage of gas to the oxygen in the space is quite sufficient, this depending on the nature of the burning goods, and ranging from 10 to 25 per cent. Taking as the outside limit an admixture of 25 per cent, the "Gronwald" appliances are able to fill with even so high a percentage as 25 per cent in about one hour's time a space of 67,200 cubic feet, which means the contents of 48 steel cylinders of 40 pounds liquid CO_2 each. According to the size of the ship, a number of 50 to 70 cylinders of CO_2 is a very fair supply for fire protection. Vessels having refrigerating installations can, of course, combine the use of the cylinders both for refrigerating and fire appliances, if provided with an ample stock.

The Japanese government intends to spend $75,000,000 during the next five years on railway construction and equipment. Among other items, appropriations are made for doubling 830 miles of track, and for constructing 900 locomotives, 1,000 passenger cars, and 19,000 freight cars.

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Typewriter mechanism, J. B. Secor..... 869,526
Typewriters, platen rotating mechanism for, H. J. Otto..... 869,386
Typewriting machine, H. W. Merritt..... 869,502
Typewriting machine, A. W. Buckwell.... 869,547
Typewriting machine indicator, H. A. Dewing 869,832
Valve, Wheildon & Maxwell..... 869,281
Valve and by-pass, hydraulic four-way, W. J. Tretch 869,755
Valve connection, triple, F. L. Clark..... 869,623
Valve, engine stop, J. L. Kimball..... 869,248
Valve, gate, L. Schutte..... 869,525
Valve grinder, P. F. Pilliner..... 869,647
Valve mechanism for air compressors, Lafferty & Spence..... 869,373
Valve, safety, L. Schutte..... 869,524
Valve, sensitive triple, W. B. Mann..... 869,637
Valve, steam actuated, G. W. Meyer..... 869,794
Vegetable topping machine, A. E. Vrooman. 869,816
Vehicle body, H. H. Porter, Jr..... 869,260
Vehicle door, Ludwig & Bradbury..... 869,249
Vehicle spring suspension, W. W. Macfarren 869,583
Vehicle top support, T. Heney..... 869,567
Vehicles, means for checking side slip of road, W. E. Monro..... 869,640
Vending apparatus, A. Rosenfeld..... 869,807
Vending machine, cigar, A. Jacobs..... 869,635
Volatile substances, purifying, J. U. Lloyd. 869,375
Wagon box and stock and hay rack, combined, O. K. Hibbets..... 869,303
Wagon, dumping, T. Wright..... 869,677
Warp stop-motion, B. F. McGuiness..... 869,643
Wash and bath tub and ironing table, combined, A. Lombardo..... 869,790
Washer, C. G. Ette..... 869,235
Water cooler, J. T. Cole..... 869,551
Water measuring gate, A. H. Stokes..... 869,274
Water meter, C. F. Merrill..... 869,320
Water meter, N. W. Hartman..... 869,841
Water motor, T. M. Heister..... 869,568
Water motor wheel, B. B. Bush, reissue.. 12,713
Wheelbarrow wheel, Baker & Smith..... 869,343
Wind power, machine for use with, J. Homola 869,709
Winding device, S. W. Wardwell..... 869,604
Windmill regulator, O. C. Hoevet..... 869,242
Window cleaner, B. A. Hill..... 869,842
Window construction, R. E. Turnbull..... 869,466
Window screen, H. Wright..... 869,470
Window screen, A. A. Day..... 869,693
Window tightener, J. M. Haddock..... 869,631
Wiping strip and making same, C. S. Clark 869,418
Wire and wood slats, machine for weaving, T. F. Hagerty..... 869,705
Wire fastener, L. R. Peeples..... 869,458
Wire stretcher, G. H. Weyant..... 869,402
Work bench, portable, H. Rosenbaum..... 869,461
Work locating indicator, Dennis & Lindholm 869,483
Wrapping machine, J. M. Patterson.869,388, 869,389
Wrench, C. H. Myers..... 869,255
Wrench, J. F. Large..... 869,496
Wrench, A. L. Shears..... 869,527
Wrench, E. H. Vanderslice..... 869,670
Wrench, A. S. Pearce..... 869,802
Zinc skimmings, utilizing, B. Terne..... 869,750

TRADE MARKS.

Asbestos composition shingles, slate, and sheathing, Asbestos Shingle, Slate and Sheathing Co. 65,862
Bitters, M. Rothenberg..... 65,859
Boots and shoes, leather, Selz, Schwab & Co. .....65,863 to 65,866
Boots and shoes, leather, Smith-Wallace Shoe Co. 65,869
Boots and shoes, leather, Drake-Inness-Green Shoe Co..... 65,878, 65,879
Candies, Adams Argood Chocolate Co..... 65,896
Canned fruits and vegetables, Burt Olney Canning Co. 65,905
Canned fruits and vegetables, Warfield Pratt Howell Co. 65,917
Cement, Portland, Fredonia Portland Cement Co. 65,868
Cheese, roquefort, L. Rigal..... 65,914
Chemicals, certain, Albright & Wilson.... 65,861
Coats, vests, and pants, Novick Bros..... 65,909
Corn or corn chops, cracked, Gulfport Grocery Co. 65,907
Cotton duck, Mount Vernon-Woodberry Cotton Duck Co.....65,946, 65,947
Cotton fabric, certain, Mount Hope Finishing Co. 65,945
Electric conduits, American Circular Loom Co. 65,955
Fertilizers, Virginia-Carolina Chemical Co... 65,894
Flavoring extracts, R. Hardesty Manufacturing Co. 65,913
Flour, wheat, Allen & Wheeler Co..... 65,898
Flour, wheat, A. B. Smith & Co..... 65,916
Food, prepared stock, Gulfport Grocery Co.. 65,908
Foods, certain cereal, Allen Brothers Co.... 65,897
Furniture, certain, Simmons Manufacturing Co. 65,950
Ginger ale, William J. Stange Co..... 65,954
Ice cream cones, Andalaft Bros..... 65,899
India rubber, gutta percha, and other vulcanizable gums, G. A. Alden & Co..... 65,872
Liniment, T. G. Castor..... 65,852
Lumber, rough and dressed, J. M. Card Lumber Co. 65,887
Mattresses, Southern Cotton Oil Co..... 65,893
Medicine, certain, W. C. Otterson..... 65,857
Medicine to perfume the breath, T. Mori... 65,856
Metal polishing and abrasive material, W. R. Forbush 65,867
Metallic leaf depositing implements, W. H. Coe Manufacturing Co..... 65,951
Middlings and red-dog, Wells Flour Milling Co. 65,918
Military equipments, certain, Mills Woven Cartridge Belt Co..... 65,890
Mouth wash and gargle, tooth paste, and throat pastil, J. F. Carnegie..... 65,851
Nozzles, H. B. Sherman..... 65,949
Ointment, Thompson Drug Co..... 65,860
Paint, enamel, and varnish, Hockaday Paint Co. 65,885
Paint, roofing, Pittsburg-Salt Lake Oil Co... 65,891
Paints and painters' materials, certain, Peninsular Paint and Varnish Co..... 65,911
Paper, cover, American Writing Paper Co., 65,873 to 65,876
Pills, laxative horse, J. S. Berner..... 65,850
Printers' quoins, Wickersham Quoin Co., 65,952, 65,953
Razors, Gem Cutlery Co..... 65,941
Remedy for headache and heartburn, T. Mori 65,854
Remedy for inebriety, Physicians' Co-Operative Association..... 65,858
Remedy for seasickness, T. Mori..... 65,855
Sewing machines, Markt & Co..... 65,943
Shirts, dress and negligee, Burnham Hanna Munger Dry Goods Co. 65,904
Soap, Max Huncke Chemical Co..... 65,889
Soap for laundry use, Procter & Gamble Co. 65,892
Soap, laundry and toilet, Enterprise Soap Works .....65,880 to 65,882
Soap, perfumed, A. & F. Pears..... 65,895
Soap, toilet, James S. Kirk & Co..... 65,888
Soaps and detergent washing powders, Fischer Bros. 65,883
Sponges, certain prepared, G. Glass..... 65,884
Sugar, Rockwood Brothers Co..... 65,915
Teas, J. B. Brown & Co.....65,902, 65,903
Teas and coffees, J. B. Brown & Co..... 65,901
Tobacco, cigars, cigarettes, and snuff, smoking, De E. De W. J. Van Nelle..... 65,877
Undergarments, combination, Birkenfeld Strauss & Co..... 65,900
Varnish, varnish stain, and paint, Hockaday Paint Co. 65,886
Veterinary medicine, S. P. Crawford..... 65,853
Washing crystals, soluble, Magi Washing Crystals Co. 65,942
Watch movements, A. Wittnauer Co..... 65,871
Water, mineral, Miraco Co..... 65,944
Wheat, breakfast, Pacific Milling Co..... 65,910
Whisky, Albert M. Gugenheim Co..... 65,919
Whisky, M. L. Bayer..... 65,920
Whisky, O'Neil & Richardson..... 65,948

LABELS.

"Brandy-Book Charentais," for brandy, Syndicat des Viticulteurs des Charentes et de la Societe Co-operative annexe de Saintes 13,842
"Do-No Liver, Kidney and Constipation Tablets," for medicine, L. G. Denton..... 13,846
"J. & H. Cup Quality," for roasted coffee, James & Hug..... 13,843
"Katarol," for a medicinal preparation, I. C. Schimelfenig 13,845
"Lava Salt-Herbs," for preparation of meats and vegetable soups, J. J. Ruegg..... 13,844
"Lightning Star," for a dressing for pianos, automobiles, carriages, hacks, and all kinds of furniture, J. Gaoutte..... 13,847
"Sweet-Orr Belt Grip," for trousers, Sweet-Orr & Co..... 13,848

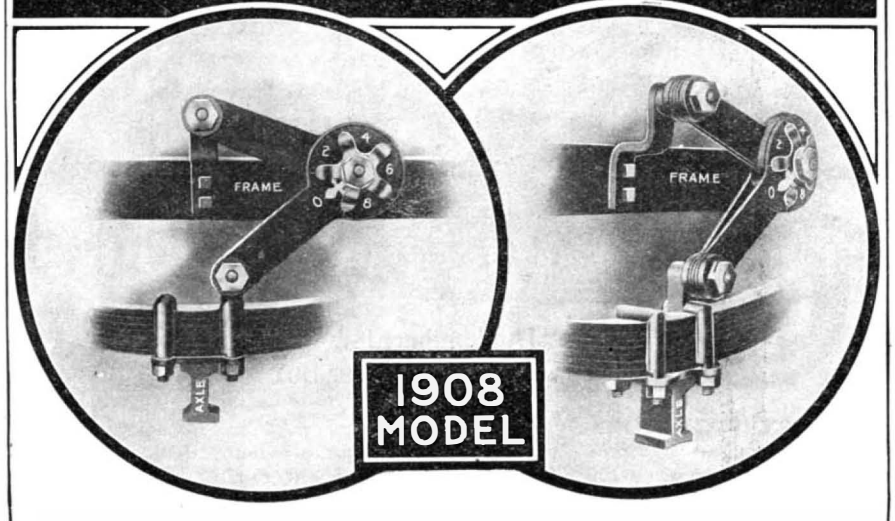
PRINTS.

"Elk Brand," for shes, G. A. Lutz..... 2,144
"Hasn't Scratched Yet!!! 16 Y'r's on the M'k't," for a scouring soap, Bon Ami Co. 2,142
"Men's and Boys' Apparel," for men's and boys' apparel, H. C. Lytton..... 2,143
"Treat Yourself Right," for a brand of whisky, Meyercord Co. 2,141

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

TRUFFAULT-HARTFORD TRADE SHOCK ABSORBER MARK



The Device That Made

SAFE, SPEEDY and COMFORTABLE AUTOMOBILING Possible

The spring action of a car affects its smooth running qualities. Proper control of the springs prevents excessive oscillation, which insures LESS WEAR and TEAR, LONGER LIFE OF TIRES, GREATER SPEED and GENUINE **COMFORT.**

This control of the springs can be secured only by the use of TRUFFAULT-HARTFORD Shock Absorber—the device that has made SAFE, ECONOMICAL AND COMFORTABLE automobiling possible.

In the 1908 model we believe that we have practically obtained perfection.

A distinctly new feature has been added, consisting of a regulating dial with indicator, making it possible for even a novice to obtain a perfect and uniform adjustment to suit the exact requirements of the car as measured in terms of its gross weight, and easily secure the maximum benefit.

The Truffault-Hartford is the only spring retarding device manufactured with a regulating dial. It is automatically lubricated, absolutely dust and water proof, interchangeable, practically indestructible and *fully guaranteed.*

The superiority and individual qualities of the Truffault-Hartford Shock Absorber are best demonstrated by the fact that it has been adopted exclusively as equipment by such prominent cars as the:

Pierce Great Arrow, Studebaker, Stevens-Duryea Big Six, Stoddard-Dayton Six Cylinder, Marmon, Continental, Lane, Conover, Sultan, Frontenac and Acme Six Cylinder.

Write To-day for Our "Ruff Road" Booklet. Address Department 2.

Hartford Suspension Company

E. V. Hartford, Prest. **72 Vestry St., New York**

THE AUTO-SLIP ARCHIMÈDE.

(*Continued from page* 332.)

can be tipped with ease to any desired inclination. The proper approximate position of equilibrium for any particular car can be determined, once for all, by hauling the car up until the rails can be propped in a horizontal position (Fig. 2), slackening the cable and moving the car by hand until it can be tipped by a moderate effort. The wheels are then strapped to the rails and their places are marked.

The car is removed from the apparatus by simply reversing the motion of the winch, allowing the vehicle to move slowly down the rails, which return automatically to their initial position.

"NEWMASTIC"—A RELIABLE AND ELASTIC FILLING FOR PNEUMATIC TIRES.

So much has been written about puncture-proof tires and spring wheels, which would make pneumatic tires no longer necessary, that everyone is inclined to be very skeptical toward any invention of this nature.

The records of the United States Patent Office at Washington show about three thousand patents as evidence of the efforts of inventors along these lines. Solid rubber tires of various forms of construction have solved the problem for many strongly-built automobiles, but it is a well-established fact that the pneumatic tire or its equivalent is an absolute necessity on the ordinary form of pleasure vehicle, as it is usually operated. Perhaps the best substitute and nearest equivalent to a pneumatic tire is what is known as a "filled tire," which consists of an ordinary pneumatic tire inflated with an elastic, soft, spongy substance instead of air. The method of manufacture employed is to inject the filling material in a liquid state under pressure, and to thus inflate the tire to whatever degree is desired. The main difficulty has been that the user is compelled to send his wheels, tires, and inner tubes to the factory for inflation, and that after the tires were filled there was no means by which the user could increase or decrease the inflation to suit his own particular case. "Newmastic" is the only one of these tire fillers that is known to any extent. In England and France "Elastes" has been used quite extensively, but this compound is said to be far from successful, for the reason that when first manufactured and injected into the tires, it requires two weeks in which to harden sufficiently to be used. The main difficulty seems to be that the material continues to grow harder and harder as it gets older. "Newmastic," on the contrary, sets within a very few minutes after it is first put into the tires, and is ready to be used at once. Strange as it may seem, this compound appears to improve with age, remaining soft and resilient at all temperatures from 15 deg. below zero up to the burning point.

In order to overcome the objection of shipping wheels from distant points to the factory, and also to enable the user to vary the degree of inflation of his tires at will, a very simple form of universal clincher rim has been invented.

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This is made by taking an ordinary one-piece standard clincher rim, and cutting it into two equal parts by removing about a quarter of an inch from the center of the rim all the way around. The inside half is securely fastened to a plain steel band upon the felloe of the wheel. The outside or removable half of the rim slips over this band, and is drawn toward the permanent half by a stiff ring which is drawn up by ordinary bolts through the felloe of the wheel. In this manner the width of the clincher rim may be slightly varied, and the edges of the clincher tire may be drawn closer together than the standard clincher measurement, or may be left slightly farther apart. This variation in the width of the tire is so small as to cause no injury to the tire, and yet it is sufficient to take up the stretch in the casing and to afford any required degree of inflation. This principle of inflating a tire by drawing the casing tightly about a filled inner tube is entirely new, and applications have been made for patents in the United States and all foreign countries.

Air under pressure in a tire expands and contracts according to the temperature, and an air-inflated tire is therefore subjected to a constantly varying pressure, and consequently to a constantly varying wear; while a tire inflated with an elastic solid material is always subjected to a constant pressure from within, for the reason that the filler expands and contracts in substantially the same ratio as the rubber itself. A tire thus inflated is never rim cut, owing to flat running, and the automobile owner can obtain from his tires an amount of wear which is as constant as that which he will receive from a suit of clothes. This affords a very great saving, but the greatest advantage of all is that tires filled with the new substance are no more affected by punctures than is a pin cushion by the pins that are stuck into it; even punctures from bolts or railway spikes will not ordinarily let the filler escape. When a really large and serious cut or break occurs in the casing, a tire bandage or gaiter will repair the damage sufficiently for the journey to be completed, and, in many cases, a tire will run hundreds of miles with such a temporary repair. Tires so inflated ride just as smoothly as tires inflated with air at the same pressure, and it is impossible even for an expert to tell from the outside of a tire whether it is inflated with this substance or with air.

THE GEARLESS TWO-SPEED TRANSMISSION.

(*Continued from page 324.*)

wear from this cause. Furthermore, instead of the drive being through friction disks at all times, in this instance it is through the friction rollers only, and that during a very small part of the time when the car is running.

The new transmission is similar in design to the ordinary two-speed planetary gear. It consists of an expanding-ring clutch mounted on the end of the crankshaft, and to which is attached a driving cone upon which can revolve five conical rollers arranged annularly around it, and contacting on their outer surfaces with the inner surface of a conical driving cup which is loosely mounted upon the propeller shaft. Either this latter cup or the cage containing the rollers can be locked to the propeller shaft by means of a sliding jaw clutch. An internal spring keeps the parts under pressure, so that the rollers will not slip when they are in use. To obtain the low speed, the driving cup is held stationary by a band brake, and the cage of rollers is locked to the propeller shaft by means of the jaw clutch. The drive is then from the inner cone to the rollers, and from the cage of the rollers to the propeller shaft. As the outer cup is held stationary, the rollers move around within it at a reduced speed. A speed reduction of three to one is thus obtained from the crankshaft to the rear axle. To obtain the reverse, the cage of rollers is held stationary by means of another band brake, and the outer driving cup is locked to the propeller shaft by the jaw clutch. The drive is then from the inner cone through the rollers (which merely revolve upon their axes) to the outer driving cup, which turns in the opposite direction. The high speed is obtained by the main expanding-ring clutch. All the parts are locked together on this speed. The only parts that can wear in this transmission are the rollers. These are made of a special paper composition that is said to be very durable. All the parts of the transmission are exceedingly large and heavy, and apparently they should easily outwear the other working parts of the car. The transmission appears to be a very neat solution of the problems encountered in the usual planetary gear and friction-disk types.

THE POWER PLANT OF THE HOLSMAN CAR.

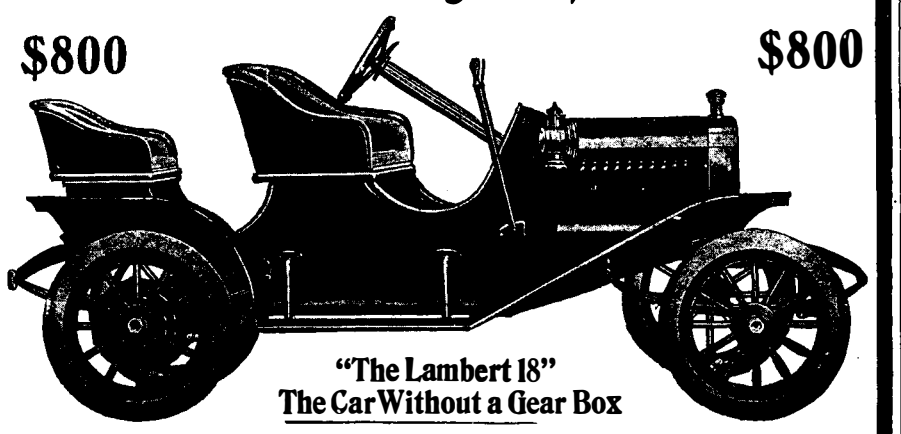
(*Continued from page 324.*)

stroke of these cylinders is 4 inches. The new engine has a number of features that are more or less important. Principal among these are the arrangement of the bearings so that they can be readily removed and replaced without taking the engine apart or removing the crankshaft. Special oil wells have been arranged in the crankcase cover, and these catch the oil which is splashed up by the cranks, and feed it by gravity to the crankshaft bearings. A certain amount of oil is carried in the crank case for the purpose of splash lubrication, and as plenty of this oil is thrown into the rear cylinder, it is unnecessary to have a special oil feed pipe to this cylinder. The mechanical oiler, which is operated by a belt, therefore has but two feeds, one of which goes to the forward cylinder and the other to the center of the crank case. Instead of being mounted upon four feet, as heretofore, the motor is now clamped to two transverse steel tubes, as is shown in the photograph. An excellent feature of this motor is the method of ignition. There are two spark plugs in each cylinder. One of these is in the head of the cylinder, and the other is in the valve chamber between the inlet and exhaust valve. Two coils are used, the two plugs in the heads of the two cylinders being connected in series to one of these coils, and the other two plugs between the valves of the two cylinders being connected to the other coil. Thus it can be seen that the spark jumps both plugs at the same time, that is, the two plugs in the heads of the cylinders and also the two plugs between the valves, provided the second spark coil is switched on. Ordinarily, only one set of plugs is used, but if these become short-circuited, the other set can be immediately thrown in. It is also preferable to use both sets in starting. The engine is connected to a countershaft through two Morse silent chains. A sliding feather upon the engine shaft connects one or the other of these chains to that shaft, in order to obtain the low speed or the high speed. The final drive from the pulleys on the ends of the countershaft to the rear wheels is by means of cables, consisting of steel chains filled and covered with woven fabric. These cables are tightened by moving forward a hand lever, and the car is driven by them. When the lever is moved still farther, the cables are slackened and the brake is applied; while pushing the lever as far forward as possible, applies smaller pulleys to the tires of the rear wheels and reverses the car. There is no foot-applied brake, the entire control being effected with one hand lever. The car is fitted with a steering lever in place of a wheel, and the spark and throttle controlling handles are mounted on top of the steering-lever post, convenient to the driver's right hand.

On account of its very efficient form of drive, the Holsman machine has won in several economy and endurance tests. The machines can readily cover as high

The Lambert Friction Flyer, 1908

$800 $800



"The Lambert 18"
The Car Without a Gear Box

SPECIFICATIONS: *Capacity*—three passengers. *Wheel Base*—95 inches. *Tread*—56 inches. *Frame*—pressed steel. *Wheels*—30-inch, wood artillery. *Tires*—30 x 3-inch Michelin. *Motor*—2-cylinder opposed, 18 h. p. *Transmission*—friction. *Speed*—1 to 35 miles an hour. *Carburetor*—float feed. *Ignition*—jump spark. *Radiator*—honeycomb. *Drive*—single chain to rear axle, encased. *Brake*—external on each rear hub. *Bearings*—Hyatt Roller and Standard Ball. *Clearance*—12 inches. *Gasoline Capacity*—12 gallons. *Length of Body*—from inside of dash, 76 inches. *Width of Body*—to outside mud guard, 63 inches. *Width of Body*—32 inches. *Width of Front Seat*—36 inches inside of cushion. *Width of Rear Seat*—18 inches inside of cushion. *Height of Floor from Ground*—29 inches. *Painting*—French gray. *Upholstering*—fine quality of leather; springs in cushions and backs of seats. *Weight*—1,350 pounds. *Equipment*—two oil lamps, horn and full tool equipment. *Price*—$800 complete, f. o. b. factory.

$800 "The Lambert 18" $800

The Best Value in America at the Price

Ask the best posted mechanic of your acquaintance what he thinks of the Friction Drive, and the answer will be: "The Best on Earth." Ask a farmer and he will not know because his calling has not required that he keep abreast with the improvements in power transmission—especially as applied to automobiles.

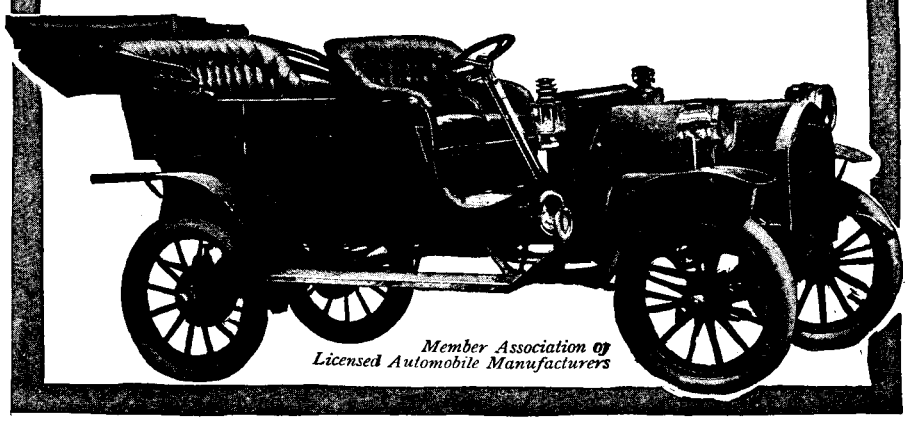
Better still, see the Lambert, have a demonstration—examine the mass of testimony that has come to us unsolicited—we feel sure that the verdict will be: "I will buy a Lambert because it is the simplest, nobbiest and best car on the market for the money. Write for catalogue 18.

THE BUCKEYE MANUFACTURING CO.
A Few Good Agents Wanted. ANDERSON, INDIANA

NORTHERN
MOTOR CAR CO., DETROIT.

For 1908 the Silent Northern embodies the same strong, enduring construction that has given it supremacy for five successive years, plus ***MORE POWER,*** due to large cylinders, larger valves and other refinements. Five years' experience manufacturing this one type insures that perfection of detail necessary to give you reliability and low cost of maintenance. This car will prove to be for you, as it has been for others, a genuine money-saver—and give you every pleasure and comfort possible to get from any car regardless of price. Investigate—find out for yourself. Send for Catalog.

The Silent Northern **24.2 Horse Power**
(A. L. A. M. rating)
Price, - - $1,600
TOP EXTRA
F. O. B. Factory including full lamp and tool equipment.



Member Association of Licensed Automobile Manufacturers

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Temporary prominence is no indication of merit. A publication may carry a considerable volume of automobile advertising for one issue, or a few issues—but a publication with Collier's record of leadership in the automobile trade, extending over a period of years, must return good value for every dollar spent. Now, that doesn't mean that you, Mr. Autosell Goods, can advertise just any automobile proposition at any time in Collier's and make money by it. Knowing when and what to advertise is important, but no more so than knowing when and what ***not*** to advertise. When the conditions are right for intelligent advertising, Collier's pays. Collier's staff, working together with the advertiser, knows pretty well when conditions ***are*** right—knows the how, when, and where of automobile advertising. With complete statistics showing just what every advertiser has done, we are in a position to plan successful advertising. Whether you sell cars or sundries, whether you propose to advertise or not, whether you finally use Collier's or some other successful medium, the fact remains: ***Collier's advertising staff has data of interest to you.*** This information is at your service. If you learn nothing else from it you will at least learn how advertising has paid some of your competitors. Why not learn at the same time how it will profit ***you?*** We are only awaiting your word to go over the proposition with you. It will cost you nothing. Write now.

This table shows the number of lines of automobile advertising carried by the seven leading national magazines for the last three and three quarter years. It demonstrates conclusively where Collier's, the National Salesman, is ranked as an automobile salesman by these manufacturers.

1903		1904		1905		1906		1907 FIRST NINE MONTHS	
Publications	*Agate Lines*	*Publications*	*Agate Lines*	*Publications*	*Agate Lines*	*Publications*	*Agate Lines*	*Publications*	*Agate Lines*
Collier's .	30,585	Collier's	32,503	Life	45,378	Collier's	45,956	Collier's	39,254
S. E. Post	23,585	S.E.Post	29,030	Collier's	45,239	Life	38,691	*Life	34,908
McClure's	20,136	McClure's	26,244	McClure's	33,480	McClure's	36,116	McClure's	21,056
Harper's	18,098	Harper's	22,396	S. E. Post	31,548	Ev'rybody's	27,188	Cosmo'itan	19,213
Scribner's	16,453	Life	20,350	Harper's	29,568	Century	26,614	S.E.Post	18,301
Century	15,232	Century	18,934	Scribner's	27,440	S. E. Post	25,712	Ev'rybody's	18,016
Rev. of Rev.	13,674	Scribner's	17,416	Century	27,005	Rev.of Rev.	25,616	American	17,934

* Size of page now 420 lines; heretofore counted as 560 lines

A more effective bit of publicity for the motor car as an institution than Collier's special Automobile Section, issued with Collier's for October 26th, is hard to imagine. Short original articles, striking pictures and especially attractive advertisements guarantee it an audience where a manufacturer's circular would find only the waste basket. Get a copy at any newsstand.

Collier's

THE NATIONAL WEEKLY

© 1907 SCIENTIFIC AMERICAN, INC.

Are You Going Away?

TRIPS OF

TWO WEEKS
THREE WEEKS
FOUR WEEKS

OR OF LONGER DURATION
TO

Summer Lands

We dispatch superb passenger ships to the

West Indies

Venezuela, Costa Rica, Panama Canal
the **Mediterranean**
the Adriatic, the

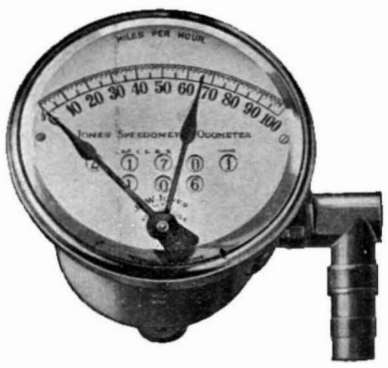
Orient

Egypt, the Holy Land, etc.

Send for our illustrated book of travel,
"Winter Voyages."

HAMBURG-AMERICAN LINE
35-37 Broadway, New York
Boston Chicago San Francisco Philadelphia St. Louis

ELECTRICAL APPARATUS REPRESENTED by Conventional Diagrams in Drawings.—Fifty diagrams showing the usual method of illustrating electrical apparatus in drawings. A labor saving paper. Contained in SUPPLEMENT 1106. Price 10 cents. For sale by Munn & Co. and all newsdealers.



Do not buy a 1908 Speed Indicator without a Maximum Speed Hand and Instantaneous Resetting Trip Odometer

¶Maximum Hand and Instantaneous Resetting Trip Odometer are positive necessities. They are exclusive with the Jones Speedometer and are included on all Jones standard instruments without extra charge.

1908 Catalog on request to Dept. 69.

JONES SPEEDOMETER
Broadway and Seventy-sixth St., New York

How to Build a 5 H. P. Gas Engine at Home

In SCIENTIFIC AMERICAN SUPPLEMENTS 1641 and 1642, E. F. Lake describes simply and thoroughly how a five horse power gas engine can be built at home. Complete working drawings are published, with exact dimensions of each part. Price by mail for the two Supplements, 20 cents.

Order from your newsdealer or from

MUNN & COMPANY
Publishers
361 Broadway, New York

as 30 miles on a gallon of gasoline under favorable conditions. On account of their ability to negotiate all kinds of country roads at a fair average speed (15 to 20 miles an hour) they are coming into extensive use by farmers, physicians, and others who want a moderate-priced machine that has a low cost of upkeep, and that can be depended upon to run regularly in all kinds of weather. As can be seen from the illustration, the Holsman is a "gearless" car in the true sense of the word. Even the differential gear is dispensed with. This has been found unnecessary, as the differential movement of the wheels in turning corners is allowed for by the slipping of the cables on the drums. Our illustration on page 328 shows the latest model Holsman machine.

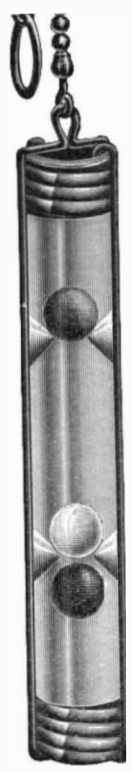
THE LAMBERT FRICTION DRIVE CHASSIS.

(*Continued from page 325.*)

driving disk. The paper-covered driven disk is slidably mounted upon a countershaft which is capable of being moved slightly forward or backward, in order to press the driven disk against the driving one, or to withdraw it while it is being shifted. A pedal moves the countershaft forward, while a spring withdraws it. A single chain transmits the power from the countershaft to the differential upon the live rear axle. Forward movement of the car is obtained by placing the driven disk on one side of the driver, and reverse motion by placing it upon the opposite side. The nearer to the periphery of the driving disk the driven one is moved, the faster the car moves along the road. The simplicity of this device is as great as its antiquity. It is only within the past three or four years, however, that this type of transmission has been made thoroughly practical. Its cost of maintenance is extremely low, while its reliability is very great. The Lambert Company has applied it to trucks of the heaviest type with equal success.

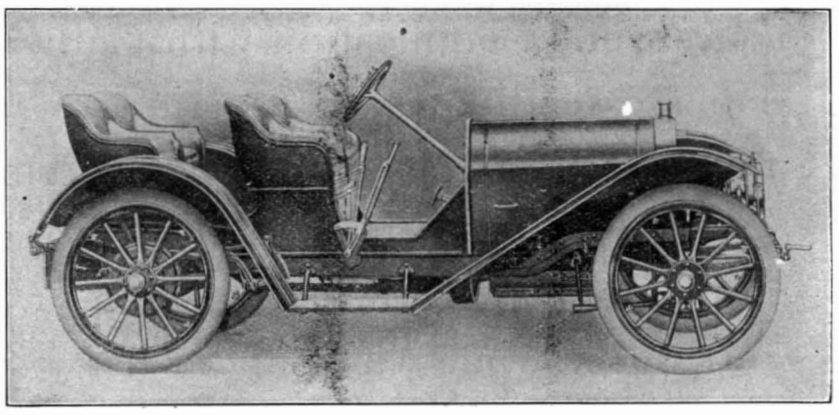
A NOVEL GASOLINE TESTER.

A novel tester for ascertaining the specific gravity of gasoline is shown in the annexed cut. This consists of three glass balls colored red, white, and blue, and arranged at different levels in the tube, which is but 3 inches high, small enough to pass through a ¾-inch hole, and which requires less than ¼ ounce of gasoline to fill it. Each ball can rise vertically



about ¾ inch. If the gasoline has a specific gravity of 60 deg. Baumé, the red ball will float; if 65 deg., the white one; and if 70 deg., the blue one. The instrument weighs but 2 ounces. It is provided with a chain a foot long. The maker is the Storage Battery Supply Co., 239 E. 27th Street, New York city.

"Second" Imperial



The Car with the Straight Line Drive

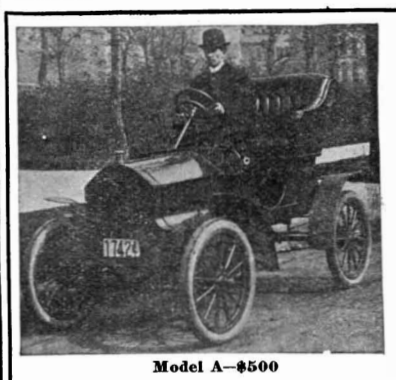
30-35 Horse Power
Double Ignition System
Eiseman Magneto
36-inch Wheels

DOUBLE DROP FRAME

PRICE (including gas lamps and generator, horn, tools, etc.)

$2,500, with folding Rumble
$2,650, with four individual bucket seats

Manufactured by IMPERIAL MOTOR CAR CO.
WILLIAMSPORT, PA.
Member A. M. C. M. A.


Model A—$500

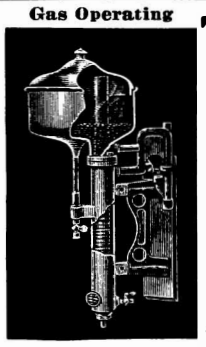
STAR RUNABOUTS

3 Models—$500, $600, $700

The nobbiest little cars on the market. Beauty, Simplicity, Ample Power, Perfect Control, and Low Cost of Maintenance make them the Ideal Car for business, professional or pleasure uses. Flexibly built to withstand hard usage on rough roads in city or country. Have three-point spring suspension, pneumatic tires, shaft drive and many other good points. Let us tell you about them. Fine selling proposition for agents. Good territory still open. Special bodies for business purposes.

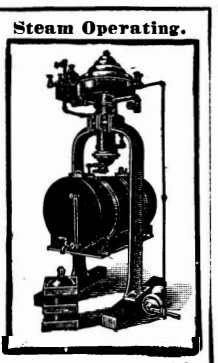
STAR AUTOMOBILE CO., 303 Dearborn St., Chicago

Gas Operating



THE JEWELL STILLS

Steam Operating.



(Patented in the U. S. and Foreign Countries.)

For Drinking Water and Technical Use

PURE WATER H_2O

They operate automatically—delivering the distilled water cold, aerated, palatable, crystal clear and germ proof.

Homes, Apartments, Office Buildings, Hotels, Schools, Clubs, Hospitals, etc., have installed them. Saves expense of buying bottled waters. Made any capacity.

Your architect has full details—See Sweet's Index, November 1st, 1907, or write us.

We also manufacture water softening and filtering apparatus for industrial and municipal use.

JEWELL WATER IMPROVEMENT CO., 118 W. Jackson Boulevard, CHICAGO

Motor Buggies, Little Roadsters

FURNISHED COMPLETE OR PARTS OF SAME

One and Two Cylinders—Vertical and Horizontal Air Cooled Motors. All Styles of Water Cooled Engines. Friction and Planetary Transmissions. Single or Double Chain Drive.

Differentials.—We Supply all the Necessary Parts to Convert Buggies into Auto Buggies.

NEUSTADT AUTOMOBILE & SUPPLY CO., 3932 Olive St., St. Louis, Mo.

FREE College Course in Watch Repairing

To establish myself in your locality, I will help ambitious young men of good habits to start a jewelry business within 3 months after beginning my personal instructions. My time and instructions, all books, charts, diagrams and pictures necessary to complete the full course are absolutely free. If you are alert and worthy of a successful future, write for full particulars and Lesson 1Z today. They cost you nothing.

CHAS. F. ELMORE, Principal
Correspondence School of Watch Making
Rogers, Thurman & Co., Props. 57 Michigan Ave., Chicago.

Draw More Salary

Demand for mechanical draftsmen always exceeds supply. Drawing is the open door to promotion. We guarantee that any ambitious young man can complete one course and successfully fill a drafting-room position, 160 engineering and business courses. Expert instruction. Write, state what interests you.

Intercontinental University
1411 L St., Washington, D. C.

We will mail this excellent **ELECTRIC FLASH LIGHT for 50c.** Battery capacity 8000 flashes, intense white light. Renewal battery 20c. Write for 80 page Free Cyclopedia. Has experiments on Wireless, Coils, Electric Photographs, etc. Electric Importing Co., 87 Warren St., N.Y.

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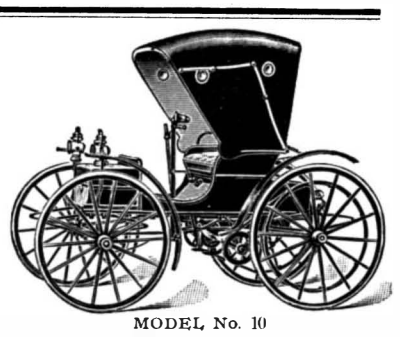
MODEL, No. 3.

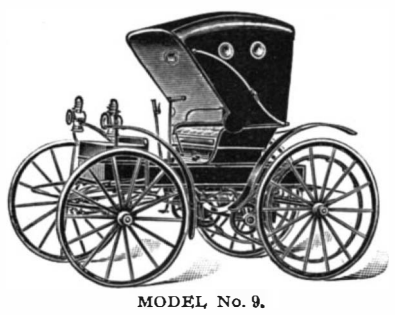
Another Perfect Score

In the Chicago 150-Mile Non-Motor-Stop Reliability Run


MODEL, No. 10

It takes time to perfect an automobile just the same as it does any other piece of machinery. The **HOLSMAN** has now been on the market

5 YEARS

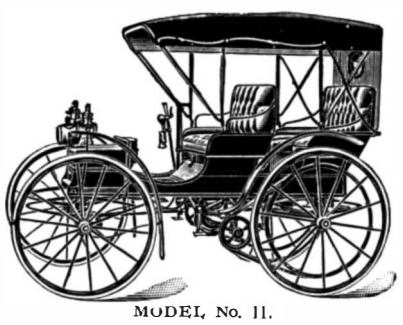

MODEL, No. 9.

and has an established reputation for stability and reliability. Do not be induced to help some new inventor work out his experiments on you by buying a machine that has not been on the market more than a year. If you are a user you will regret it, and if you are an agent you will regret it still more.

HOLSMAN AUTOMOBILE COMPANY

The Oldest and Largest Manufacturers of Carriage Automobiles

Room 403 - - - - MONADNOCK BLOCK, CHICAGO


MODEL, No. 11.

AUTOMOBILE TRAFFIC GROWTH IN NEW YORK.

Figures relating to the traffic of Fifth Avenue, New York, obtained as a result of twenty-four hours' checking of all vehicles passing a given point, were, says the New York Globe and Commercial Advertiser, given in the course of the Ahearn hearing before Gov. Hughes by J. W. Howard, the well-known paving expert of New York. The statistics were obtained by Mr. Howard and several assistants but a few days ago.

During the dullest hour of the twenty-four—from 2 to 3 A. M.—27 vehicles passed, of which 5 were automobiles, and only between 5 and 6 A. M. were motors unrepresented.

Comparing Fifth and First Avenues:

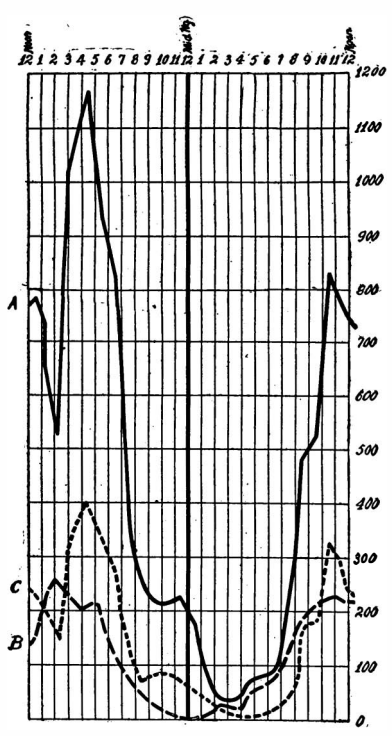


Diagram of Vehicle Traffic in New York.
A. Total traffic on Fifth Avenue. B. Auto. traffic.
C. Total traffic on First Avenue.

During the eleven hours from 7 A. M. to 6 P. M., there passed between Twenty-sixth and Twenty-seventh streets, on First Avenue, 4,445 vehicles. In the same period on Fifth Avenue, in the block between Fifty-eighth and Fifty-ninth Streets, the number counted was 7,857. The twenty-four-hour traffic on Fifth Avenue from Fifty-eighth to Fifty-ninth Street amounted to 10,379 vehicles, whereas that of First Avenue was but 2,665. From 12 P. M. to 1 A. M. the latter was practically deserted, whereas on Fifth Avenue there were 200 vehicles recorded. Between 4 and 5 in the afternoon on Fifth Avenue 1,100 vehicles were counted in one hour. The detailed traffic tables giving the number of vehicles for each hour of the twenty-four, separating the motors from the horse-drawn conveyances are full of interesting and suggestive comparisons.

Traffic on First Avenue, from noon to noon, October 9-10, at a point just north of Seventy-seventh Street:

Hours.	Horse vehicles.	Autos.	Total vehicles.
Noon	143	1	144
1-2	216	0	216
2-3	256	3	259
3-4	231	3	234
4-5	195	0	195
5-6	199	2	201
6-7	127	1	128
7-8	64	0	64
8-9	44	0	44
9-10	26	0	26
10-11	8	0	8
11-12	7	0	7
Midnight	0	0	0
1-2	1	0	1
2-3	8	0	8
3-4	25	0	25
4-5	22	0	22
5-6	56	0	56
6-7	103	0	103
7-8	131	1	132
8-9	180	0	180
9-10	209	1	210
10-11	220	3	223
11-12	177	2	179
Totals	2,648	17	2,665

Traffic on Fifth Avenue from noon to noon, October 9-10, at a point just north of Fifty-eighth Street:

Hours.	Horse vehicles.	Autos.	Total vehicles.
Noon	536	230	766
1-2	548	184	732
2-3	367	142	509
3-4	693	331	1,024
4-5	766	400	1,166
5-6	588	329	917
6-7	531	275	806
7-8	219	115	334
8-9	205	54	259
9-10	134	75	209
10-11	128	70	198
11-12	130	71	201
Midnight	112	45	157
1-2	48	20	68
2-3	22	5	27
3-4	26	4	30
4-5	53	3	56
5-6	70	0	70
6-7	88	19	107
7-8	191	31	222
8-9	270	187	457
9-10	333	179	512
10-11	505	308	813
11-12	507	232	739
Totals	7,070	3,309	10,379

Not the least interesting feature of these figures is the story they tell regarding the motor car. It appears that already more than one-third of the carriage traffic of the city is carried on in automobiles. The twenty-four-hour figures on Fifth Avenue, which may be taken as fairly typical, show 3,309 of the latter against 5,825 hansoms, coupes, etc. Probably in carrying capacity the motor cars were very nearly equal to the horse-drawn vehicles, as a considerable proportion of the former have seven places, and few of them less than five, while a large part of the corresponding hay-

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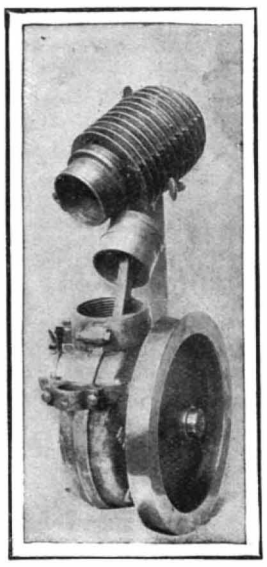
motors could carry but three persons, including the driver. It is also of some interest to note that on First Avenue during the same twenty-four hours, but seventeen motor cars of any variety, business or pleasure, were recorded.

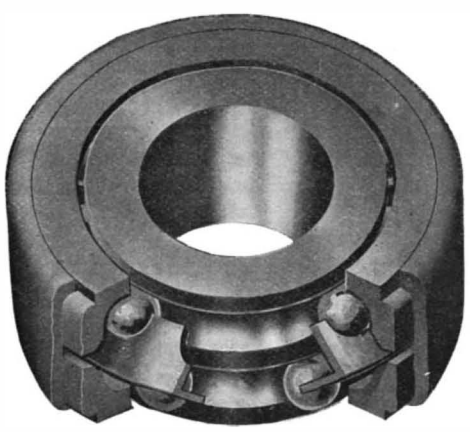
SOME IMPROVEMENTS FOR THE MOTOR BICYCLE.

A New Motor Cycle Engine.—The engine illustrated in the accompanying engraving represents three years of work in perfecting a design which should be perfectly suited to the requirements of the motor bicycle. It is a very light engine, weighing only 28 pounds and developing 2¼ horse-power on the brake. Its principal claim to novelty lies in the fact



The Mueller Improved 2¼ H. P. Motor Bicycle Engine.

that the cylinder is screwed into the crank case instead of being fastened thereto with lugs and bolts. The crank case is formed with an internally threaded cylinder. A setscrew threaded through one side of the crank case bears against the threaded portion of the cylinder to prevent it from being unscrewed. When thus locked there is no danger of the cylinder working loose, and thus are avoided the objections to the usual construction in which the bolts and nuts are often loosened by the vibration of the machine. The screw joint permits of a lighter, as well as a more lasting construction. The power of the motor is sufficient to climb grades of from twenty

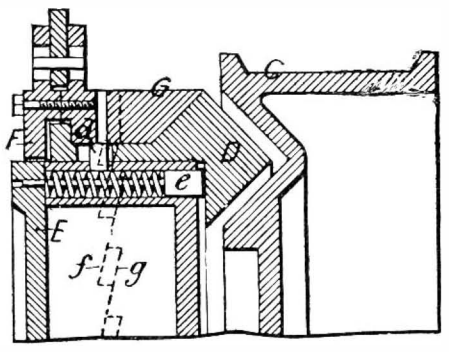


Double Roller Bearing for End and Radial Thrust.

to thirty per cent. It may be applied to standard bicycles of 22 or 24-inch frame.

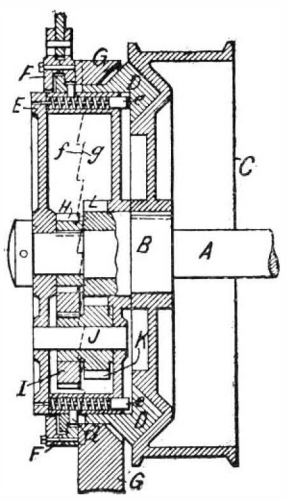
Annular Ball Bearing.—A recent improvement, particularly designed for motor cycles, though also adapted for automobiles, is an annular ball bearing with two rows of balls running in separate ball races and designed to take both radial load and end thrust. The device is, in reality, two bearings in one, and it is claimed that it will bear twice the radial load of other bearings of the same size, and also an end thrust nearly equal to its radial load capacity. Our illustration shows the bearing broken away to reveal the interior arrangement. It will be noted that the balls are kept in place by means of a separator ring which is V-shaped in cross-section, and is formed with semi-circular indentations along the two edges which fit over the balls. The separator ring rests on the balls without friction at any stationary point. The two rows of balls are designed to distribute the load evenly between them. The bearing may be used as a substitute for end thrust and radial load bearings at present used in most automobiles. In such places as a bevel gear bearing where the line of strain is at right angles with the base of the gear teeth, the thrust is intermediate between the radial and end pressure, and with a bearing, such as here illustrated, this diagonal thrust may be taken care of to the best possible advantage.

Two-Speed Gear.—The primary object of the gear illustrated herewith is to allow a motor cycle to run on the high speed without friction. This is accomplished by bringing the friction band into engagement with the pulley wheel and thus permitting practically the entire mechanism of the gear to rotate as a single pulley. The usual fiber friction surfaces are dispensed with and the frictional engagement takes place between metal surfaces. When set for low speed the friction band is held stationary and the power is transmitted through step-down gearing connected with the band. The construction will be understood by referring to the sectional views. The power shaft is shown at *A*, and it carries a sleeve *B* to which is keyed the pulley *C*. The latter is provided with a V-shaped groove into which the friction band *D* is adapted to fit. The friction band is mounted to slide in axial direction on a drum *E*, to which it is secured by means of pins *d* on the periphery of the drum and engaging slots in the friction band. A series of spring-actuated plungers *e* serve to press the band *D* against the



Friction Band in Position for Low Speed.

pulley *C*. At the opposite edge of the band *D* there is a flange which engages a slot formed in the inner periphery of an operating band *F*. The latter is provided with ratchet teeth *f* adapted to engage ratchet teeth *g* on a stationary band *G* secured to the crank box. Owing to the ratchet form of the teeth when the operating band *F* is rotated, it is moved axially away from the stationary band *G*, withdrawing the friction band *D* from the groove in the pulley *C*. Keyed to the shaft *A* is a pinion *H* which engages a gear wheel *I*. The latter is keyed to a pinion *K*, which is mounted on a shaft *J* journaled in the drum *E*. The pinion *K* in turn engages a gear *L*, formed on the sleeve *B*.



Position of Parts on High Speed.

When the mechanism is set for high

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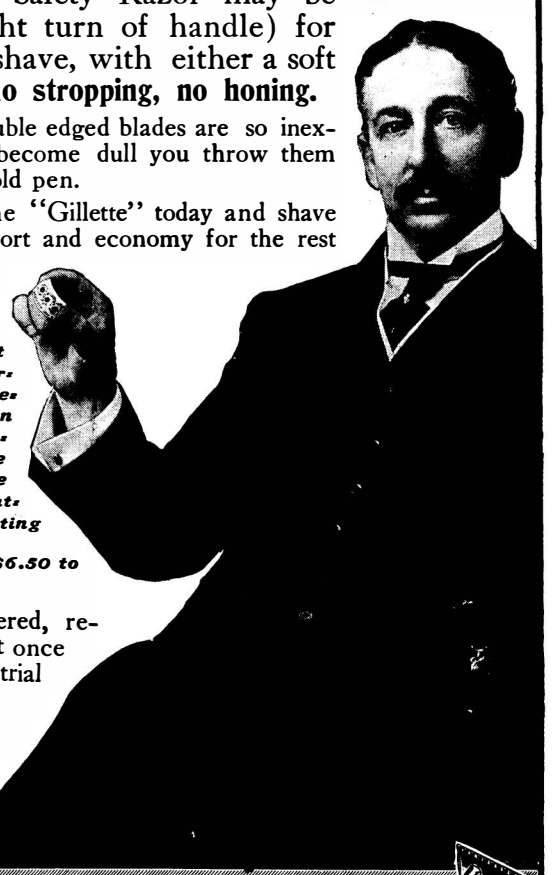
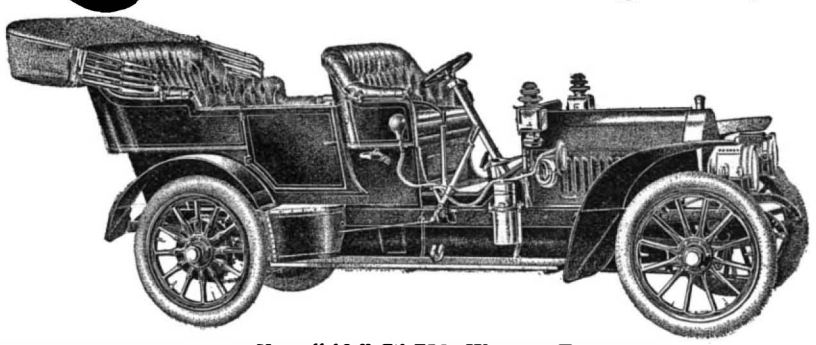


Gillette Safety Razor
NO STROPPING NO HONING

Locomobile



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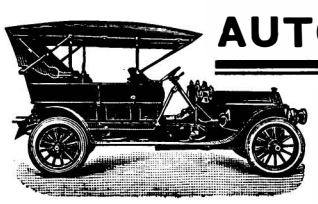

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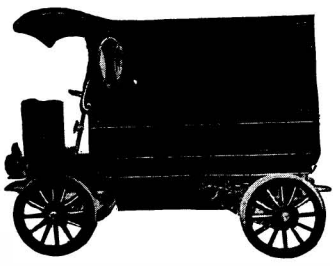

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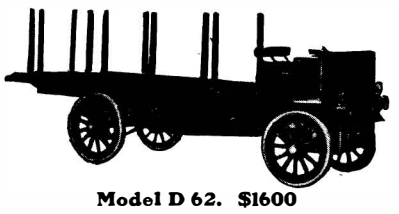
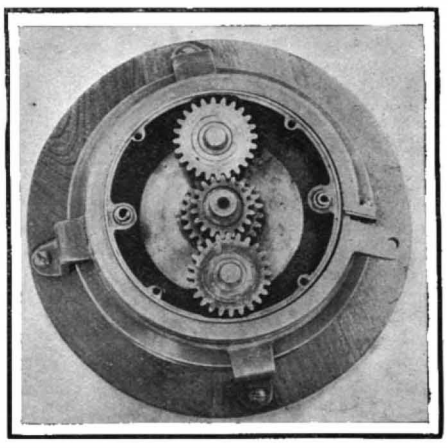


Model D 62. $1600

G. S. HENRY, *Sales Manager* Rapid Motor Vehicle Co., Pontiac, Mich.

speed the operating band *F* is turned to permit the friction band *D* to engage the pulley. No relative motion can take place between pinion *K* and gear *L* because the drum *E* and pulley *C* are locked together by the band *D*, hence the power transmitted from shaft *A* through pinion *H* to the gear *I* serves to turn the drum and pulley as a single pulley. For the low speed the friction band *D* is withdrawn by a turn of the operating band *F*, and brought into engagement with the stationary band *G*. This serves to keep the drum *E* stationary. The power of shaft *A* is then transmitted through pinion *H*, gear *I*, pinion *K*, to gear *L* on the sleeve *B*, thus driving the pulley *C*, which is



Novel Two-Speed Gear for Motor Bicycles.

keyed to this sleeve. The gearing is arranged to step down the speed the required amount. If the operating band is moved sufficiently to carry the friction band *D* clear of the pulley *C* and fixed band *G*, the engine will run free, for the drum *E* will then turn idly without transmitting any power to the pulley *C*.

The inventor of this ingenious speed gear is Dr. Sherman T. Lewis, of Room 1018 Hartford Building, Chicago, Ill.

A NOVEL FLOATLESS CARBURETER.

The carbureter shown in partial section in the accompanying illustration is an extremely simple device, with less parts to give trouble than are found in the usual automatic float-feed carbureters now generally in vogue. The gasoline enters through the feed pipe, seen at the bottom, and flows upward through a vertical pipe, 1, to a horizontal feed needle valve, *V*. This valve is operated by a vertical lever and clapper, *J*, which has a weighted disk, *W*, for the purpose of returning the valve to the closed position. The suction of the motor, as it draws air in through the inlet, *I*, causes the clapper to move inward, and the feed valve to open. The fuel, as soon as it passes through this valve, flows downward through the adjoining vertical pipe, 2, and then upward once more, through the spray nozzle pipe, 3. This pipe terminates at its upper end in a spray nozzle, and contains a needle valve, *F*, which

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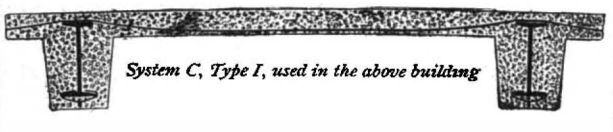

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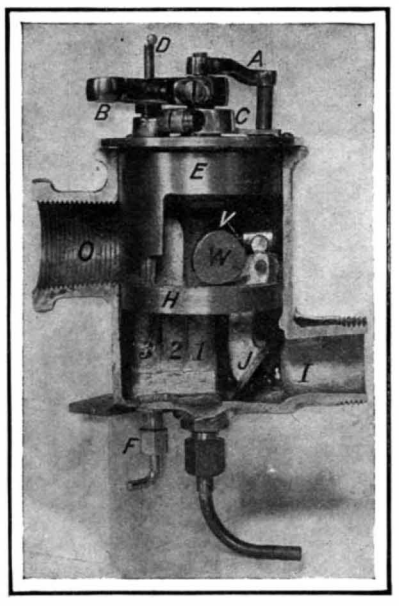
Partitions

can be adjusted from below. This valve gives the proper mixture at high speed. The carbureter has a cylindrical throttle sleeve, *E*, which is moved by the lever, *B*. By means of suitable connections within, when the throttle is closed, another needle valve, *D*, located above the spray nozzle, is brought down into the latter, and has a throttling effect. This extra spray nozzle serves to keep the mixture uniform, for when the throttle is closed, on account of the small passage for the gas, the suction is very much increased at the spray nozzle, and there



The Miller Floatless Carbureter Shown in Partial Cross-Section.

is a tendency to get too rich a mixture. The lever, *A*, seen on top of the carbureter, operates another sleeve on the opposite side of the spray nozzle to the throttle sleeve, and makes it possible to decrease the size of the orifice for the gas in case this is too large to obtain the proper suction. The Automobile Editor of this journal has given this new carbureter a thorough trial upon a double-opposed-cylinder motor of the air-cooled type, and also upon a standard 4-cylinder, vertical motor. In both cases the carbureter has given very good satisfaction and proved its economy. As there is no float or float-operated needle valve, trouble from these sources is obviated. Another good point about the carbureter is that there is so minute a quantity of gasoline in it at any time that there is no danger of fire in case of a back fire from the motor. For air-cooled engines, especially, this carbureter will be found to give excellent satisfaction, as the needle valve which controls the fuel can be closed almost to the limit, and the mixture fed to the motor can be made so poor that there is little danger of the engine overheating and giving premature explosions, even though there are carbon deposits in the cylinder heads. The inventor of this carbureter is Mr. John H. Miller, of 94 Denver Avenue, Bridgeport, Conn.

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SINGLE VIBRATOR APPARATUS FOR SYNCHRONIZING THE IGNITION SPARKS OF MULTIPLE-UNIT COILS.

This device is intended to eliminate the difference in adjustment and difference in time element of the various vibrators on the spark coil.

From the diagram it will be seen that the battery wires are transferred from the coil to the master vibrator or synchronizer, and that there is a wire which runs from the center binding post on the synchronizer to one of the battery binding posts on the coil. This places the synchronizer in series with the battery and coil, or with the magneto and coil, so that no matter which unit in the coil the timer closes the circuit on, this master vibrator vibrates for it, in place of the regular vibrator on that particular coil. Each vibrator on the coil is short circuited, as shown in the diagram, so that the current does not pass through the vibrators of the coils, but goes around them through the copper wire shunt, after which it goes through the large twin-blade vibrator of the Lacoste type. This is connected to a condenser of large capacity and having its layers of tinfoil

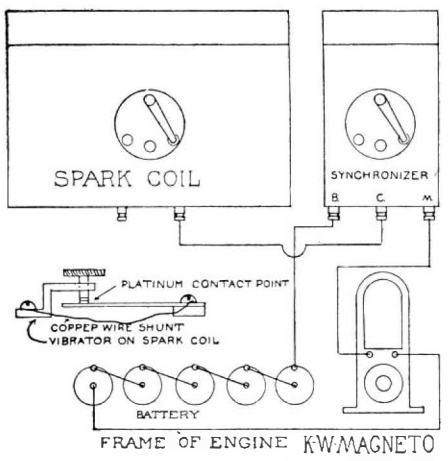

Diagram Showing Connections.

so far apart that it is practically puncture proof.

It matters not within reasonable limits what the adjustment of this vibrator is, for it vibrates for every cylinder, and no matter what its time lag is, this is the same for every cylinder, thus giving exact synchronism, and placing the sparks in every cylinder at exactly the same position of the piston and the same angle of the crankshaft, just as would a high-tension distributor and a single coil. It possesses an advantage, however, over the high-tension distributor system, for it does the synchronizing on the low-tension side of the circuit, and does not require any high-tension distributor with its consequent troubles. This device was one of the novelties at the auto shows.

LATEST IMPROVEMENTS IN THE FRANKLIN AIR-COOLED ENGINE.

(*Continued from page 322.*)

the illustration. The large lower washer is on the exhaust valve, while the smaller washer and spring are on the inlet valve. Each valve is operated by independent rocker arms. The push rods which operate these rocker arms fit into adjustable ball-and-socket joints on the latter. The incoming charge of cold gas makes its entrance through the port, 4, and the inlet valve. In doing this it passes through the hollow exhaust valve, 3, which it tends to cool.

About 60 per cent of the burnt gases are discharged through the auxiliary exhaust valve, the result being that only 40 per cent of these gases pass through the exhaust valve proper. As a consequence, this valve does not have the tendency to warp that does the exhaust valve of an ordinary air-cooled motor, and this despite the fact that the valve in this instance is a mere shell. On account of the rounding head of the cylinders, the interior surface of these is the smallest possible. This assures the use in work of the greatest number of heat units in the charges of gas, and, as a consequence, the new engine is more economical, if anything, than the old one. All the valves in the new engine are mechanically operated from a single cam shaft. In this new model, too, the fan is driven positively by bevel gears. The cylinders are oiled by splash lubrication, and a rather high level of oil is maintained in the crank cases by means of a gear-driven mechanical oiler. Baffle plates are fitted at the base of each cylinder, and these cause the oil to be drawn up by the piston suction through an opening on the working or thrust side of the piston, where it is most needed, and from which point it gradually works around to the other side. Two of the larger types of Franklin cars are this year fitted with a gear-driven Bosch high-tension magneto in addition to the usual dry battery and coil ignition. The same multiple-disk clutch that was used last year is found located in the flywheel of the 1908 engine. The only improvement which it seems possible to make on this powerful, light-weight motor, seems to be the employment of non-adjustable ball bearings on the crankshaft in place of the plain bearings now used. Perhaps, after another year, this style of bearing will be tried.

Rambler Automobiles

For the year 1908 the entire facilities of the Rambler factory will be devoted to the production of two Models, 34 and 31.

Model 34, a five-passenger touring car with four-cylinder vertical motor, 32 horse power, has selective type transmission with shaft drive. The wheel base is 112 in., wheels 36 in., with 4 in. tires. Price, fully equipped, $2,250. The same chassis, however, with appropriate changes in detail, will be equipped with a roadster body with rumble seat, at the same price.

Model 31 is a five-passenger touring car with detachable tonneau, equipped with the Rambler unit power plant, comprising double opposed motor, multiple disc clutch and planetary transmission entirely enclosed. Price, fully equipped, $1,400. This model can be furnished with torpedo deck in lieu of the tonneau, at $1,300.

Both models have been brought to the highest possible degree of perfection in every detail that insures

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THE NATIONAL 6-CYLINDER ENGINE.

(*Continued from page 322.*)

and inlet pipes on one side of the engine, and water and exhaust pipes on the opposite side. All joints are made with tapered nipples. The piping can be quickly removed after taking off one or two nuts. The distributor is now run up between two of the cylinders, instead of being placed at the back end of the engine as heretofore. The water pump, mechanical oiler, and Bosch high-tension magneto are all gear-driven. The magneto is connected to the gear on the front of the engine through a universal joint. It is fastened to the engine by a brass band, which passes over its top, and is held down by a couple of thumb nuts. It is, therefore, very easily removed, if necessary. All six cylinders are provided with two spark plugs, one of which is fed from the magneto, and the other from a single coil and distributor supplied by a battery. The material used in the engine cylinders and pistons is cast iron of an extra strong, special, fine-grained variety. The pistons are made somewhat longer than heretofore. While there are no radical changes, the engine shows many refinements and small improvements conducive to quietness of running, lack of vibration, and long life.

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The new engine brought out by the Dayton Motor Car Company, owing to complete changes in design and construction, is one of the most efficient and well-constructed motors on the market to-day. As can be seen from the illustration, the water-jacketed valve chambers surmount the cylinders, and form part of two integral castings. The inlet and exhaust valves are upon opposite sides, and each pair of valves is operated by a double rocker arm having a central roller bearing provided with a grease cup. Each pair of cylinders is fitted with a copper water jacket having four corrugations. The water is circulated by a centrifugal pump of generous size, which is gear-driven from the cam shaft. The shaft which drives the pump also rotates a Bosch high-tension magneto, which is located upon a bracket at the rear of the motor, if the purchaser desires magneto ignition.

The 30—35-horse-power motor shown has a bore of 4¾ inches and a stroke of 5 inches. The valves are all 2¼ inches in diameter. The crankshaft is a drop forging of nickel steel and is offset ⅞ of an inch from the center of the cylinders. This offset gives the greatest leverage, and reduces to a minimum the friction of the pistons on the side walls of the cylinders. The bearings are all positively oiled by a stream of lubricant, which is drawn from an oil well separate from the

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crank case proper, and is forced to all the bearings by means of a gear pump. Special oil rings fastened to the crank cheeks carry the oil which comes from the crankshaft bearings, and feed it by means of centrifugal force to the pins. The camshaft bearings are also positively oiled. The fan is mounted upon two Timken roller bearings, and is provided with a thumb-screw adjustment for tightening the belt. The flywheel is bolted to a flange, which is forged on the end of the crankshaft.

The transmission is mounted in an aluminium case formed of one solid casting, and all the bearings in the transmission are of the roller type. There is not a nut or screw anywhere in the gear box which can loosen and get into the gears. The telescoping shaft of the transmission is fitted with a long, plain, roller bearing, while all the other bearings are of the Timken type. The gears are all made of chrome nickel steel, and the shafts of a special high-carbon steel. Both the propeller shaft and the floating rear axle run on Timken roller bearings. Internal and expanding brakes are fitted on the rear wheels, and consist of steel bands lined with camel's hair belting. The internal brake bands are 2½ inches wide, and are operated by a pedal. The other brakes are operated by a lever beside the driver's seat, and it is also possible to use the motor as a brake by cutting off the ignition. By opening the auxiliary air valve, which can be done from the seat, the motor will draw in only pure air while it is being used for braking. The ordinary ignition equipment of the motor consists of a four-unit coil and storage batteries, and the magneto is only fitted in case two systems are desired.

THE HEWITT 8-CYLINDER 90-DEGREE MOTOR.

(*Continued from page 323.*)

placed in valve chambers on the upper sides of the cylinders. A single cam shaft within the crank case and between the cylinders operates all the valves. The connecting rods and pistons, while light, are still strong and substantial. On account of the perfect balance of all the parts, the motor can be speeded from 250 to 2,500 revolutions a minute without trouble. The 50 to 60 horse-power engine which we illustrate has cylinders of 4 inches bore and 4½ inches stroke, and develops its rated horse-power at 850 to 900 R. P. M.

THE CARTER TWO-ENGINE CAR.

(*Continued from page 323.*)

inventor claims one horse-power for every 75 pounds of total weight. He has carried his ideas still further in the construction of both 4 and 6-cylinder water-cooled cars having twin radiators and engines (that is, two 4-cylinder engines or two 6-cylinder engines). The advantage of the duplex radiators is said to be quite as great as that of the duplex engines; and as far as economy is concerned, the inventor claims that his system is more economical of fuel than the usual system of employing but one high-powered engine.

THE 1908 PEERLESS MOTORS AND TRANSMISSION.

Although the Peerless Motor Car Company has brought out a new 6-cylinder model for 1908, this has not been done altogether because the officers believe the 6-cylinder to be superior to the usual 4-cylinder. Mr. Charles Schmit, engineer and designer of the Peerless Company, spent some six months abroad visiting the different factories, before he designed and manufactured his first 6-cylinder car. He has been engaged during the past year in perfecting this car, and the company is now ready to place it upon the market. The trial car of this type will be seen illustrated on page 323. The new 6-cylinder motor does not differ from the 4-cylinder motor essentially, the only difference being that there are three pairs of cylinders instead of two. Our illustration gives a very good idea of the appearance of the 1908 30-horse-power 4-cylinder motor. This engine has cylinders of 4⅞ inches bore by 5½ inches stroke. With this bore and stroke, one can readily see that the rating of 30 horse-power is merely nominal. Imported material is used largely in the construction of this motor. The cylinders and pistons are imported castings, and much of the steel, such as the valves, etc., is made of silico-manganese alloy. The crank case is a single aluminium casting made in the factory, and designed especially for strength and non-leakage of oil. There are special pans at the bottom of the crank case for the collection of dirt and sediment, and this can readily be removed by taking out a plug. The connecting rod and crankshaft bearings can readily be adjusted by removing these plates on the bottom of the crankcase compartment. Splash lubrication is employed, the level in the crank case being maintained by special feed pipes from the mechanical oiler, which also supplies lubricant to all of the cylinders. The crankshaft is a solid drop forging, specially treated, hardened, and ground accurately to size. The front bearing is a ball bearing of the annular non-adjustable type, and it is fitted with a stuffing box to prevent leakage of oil. This type of bearing has been used in this place in order to shorten up the motor. All of the other bearings are plain. The two-to-one gears and other gears which drive the magneto, timer, etc., are completely housed and run in oil. In accordance with the usual practice now, the fan is positively driven by bevel gears. Great care is exercised in balancing perfectly all the working parts of the motor, and in order to do this all these parts are accurately weighed before they are assembled.

Instead of being located in the casing with the two-to-one gears as heretofore, the governor is now placed on the shaft which drives the gear water pump, and which is located on the left-hand side of the motor. The neat manner in which this governor is incased can be seen by a glance at the illustration. The rounded enlargement at the forward end of the aluminium casting which forms the crank case contains the two balls of the governor. These balls are rather small and light, but they have weight enough to operate the piston valve of the carbureter by means of suitable lever connections extending to the other side of the motor, where the carbureter is located between the two middle cylinders at the side of the crank case. The carbureter is of the usual type, with an automatic air valve, and the throttle is controlled by a hand lever on the steering wheel, by an accelerator pedal, and by the governor. The governor maintains the speed of the motor at the point which corresponds to the setting of the throttle lever on the steering wheel.

The motor is fitted with two separate ignition systems and two separate sets of plugs. There is the usual battery and coil system, and there is also an Eisemann high-tension magneto. The two systems are entirely independent, and can be used separately or together, as desired. The lead of the magneto armature can be changed by a special shifting collar that moves a sleeve with a spiral slot which surrounds the end of the armature shaft. The shifting collar and lever for operating the same can be plainly seen in the front view of the motor. All the wires are neatly incased in fiber tubing, and are made as short as possible. There are no thumb nuts to loosen in removing the wires, as they are all attached by means of spring clips. The commutator is located upon a vertical shaft brought up between the two pairs of cylinders. The commutator is built exactly like the commutator of a dynamo, it being made of eight copper segments, four of which are dummy segments, and the segments being insulated by mica. Great care is

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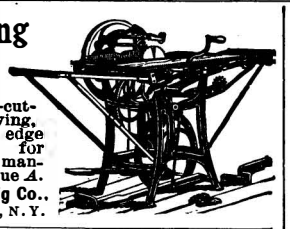

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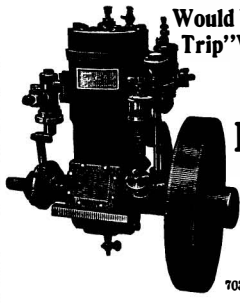

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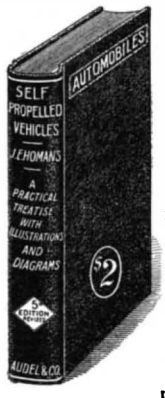

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used in grounding the current, this being done by means of a special brush wired to the contact brush, and which bears upon the vertical shaft. Instead of moving the commutator when it is desired to advance the spark, there is a very convenient arrangement which advances the shaft carrying the roller contact brush. This shaft is in two parts, the lower of which is driven by spiral gears from the cam shaft and is connected to the upper half through a movable sleeve with a spiral slot, which can be moved by means of a sliding collar and which thus causes the upper half to turn with relation to the lower.

The flywheel contains the usual internal expanding ring clutch, which is very light, consisting, as it does, of a leather-lined steel band mounted upon an aluminium core. This clutch has given very good satisfaction during the last few years, and it is a type that can be readily adjusted with a screw-driver or a pair of pliers. The transmission used in conjunction with the motor is of the 4-speed selective type. An illustration of this transmission appears on page 325. An improvement worthy of notice is the meshing of the reverse pinion face on with the other gears, and a special cam, which positively locks this pinion out of mesh when it is not in use. The operating rods which slide the gears are now made round instead of square, and are notched so that the gears can be locked in place by means of a suitable latch. Two universal joints are fitted between the engine and transmission as well as in the propeller shaft. Cardan joints are also placed in the rear axle driving shaft on each side of the differential. This arrangement makes it possible to give a slight camber to the rear wheels as well as to the front ones.

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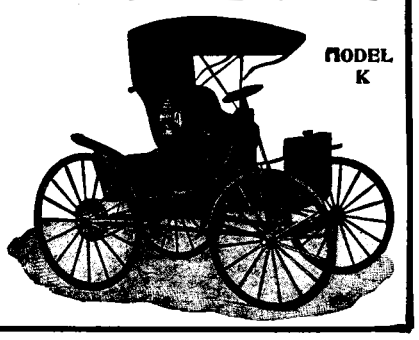

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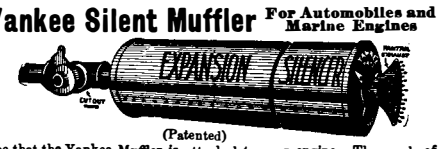

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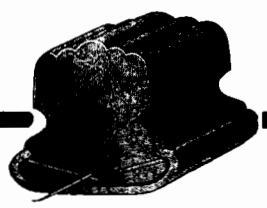
case. The crankshaft is provided with suitable counterweights, and at one end a spur gear drives the gear on the mechanical oiler; while the commutator and pump, which are placed on a vertical shaft above and below the center line of the crank case, are each driven by spiral gears. The pump is of the usual gear type, and the carbureter is of the float-feed variety. The company builds a 2, a 3, and a 4-cylinder engine for use on their two, three, and four-ton trucks, respectively. Each cylinder is rated at 15 horse-power, and if any truck is underpowered for the work it has to do, it can be equipped with the next size larger engine. The Reliance trucks are all equipped with a heavy three-speed sliding gear transmission. The final drive is by chain from the countershaft to the rear wheels. The construction throughout is very simple and substantial, and of a kind which should stand up well in use.

TYPES OF SHOCK ABSORBERS FOR AUTOMOBILES.

(*Continued from page 326.*)

Another method of retarding excessive spring action by frictional resistance is employed in the Gabriel shock absorber (Fig. 4). Two long strips of finely-tempered spring steel are bolted together at their ends, with steel blocks and thin steel washers between, so as to leave a long, narrow space between the two strips. A steel plate, recessed on each side to hold pads of camel's hair belting, is placed between the long steel strips, the pads of camel's hair belting being next to the inner surfaces of the strips, and causing them to spring apart considerably. A stud in the steel plate projects through a long slot running the full length of one of the steel strips, and this stud is screwed into the frame of the car, just above the middle of the spring. One end of the pair of steel strips is secured to the middle of the car spring by a special angle plate adapted to be held down by the clamps that secure the spring to the axle. As the car rises and falls on its springs, the padded plate slides up and down between the spring steel strips. While the car runs on fairly smooth roads, where spring movement is slight, the movement of the padded plate is confined to the central portion of the device, where there is but little friction, and the free play of the springs is not checked. When rougher roads cause a wider range of spring action, however, the padded plate is moved further up or down toward the ends of the strips, where the space is more contracted and friction is, consequently, much greater. Thus the friction increases gradually as the spring movement increases, whether the movement is upward or downward. The thin steel washers, already mentioned, inserted with the steel blocks between the ends of the strips, can be removed to increase the spring pressure on the padded block, or more can be put in to reduce friction, thus providing a simple means of adjustment. Lateral motion of the car body, or swaying, is provided against by elongating the bolt holes in the top of the device, and by not setting up the bolt at that point very tightly, allowing a little play. Camel's hair belting, it may be said, is remarkably well adapted to resist wear under the conditions imposed here. This material is also frequently used for the facing of brake bands, especially on the contracting and expanding brake bands generally used on the rear-wheel drums of almost all high-powered automobiles.

Springs of special form are utilized in the Shippey shock breaker (Fig. 5). Two flat steel springs, bolted together at their lower ends, curve away from each other toward the top. Extensions of the main springs are carried inward and downward, coming together at the center and acting as auxiliary springs to add to the force holding the main springs apart. This forms the part of the device which is attached to the axle or spring of the



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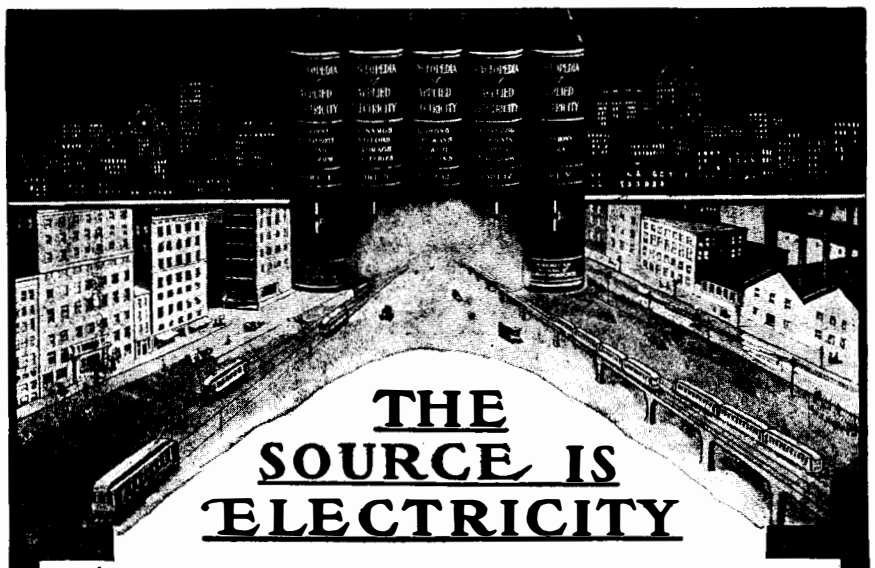

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car. Secured to the frame is a steel bracket carrying two hardened steel rollers, between which the springs of the shock absorber move up and down as the car springs play. There is but little resistance to the downward movement of the car springs or to the first part of the upward movement; but as the spring begins to exceed normal limits of motion on the rebound, the shock absorber springs are drawn down between the rollers, and the force required to compress them checks the upward movement. The higher the car body rises the greater is the resistance offered, as the springs are furthest apart at the top, and more force is required to compress them.

In the Hotchkin anti-jolt device (Fig. 6), the resistance offered by a small aperture to the passage of a liquid is made to check the rebound of the car springs. A circular chamber (Fig. 7) accurately finished interiorly, is filled with glycerine and fitted with a radial piston on a steel shaft, the piston being packed with leather to make it tight in the chamber. The shaft passes out through a stuffing-box in the cover, which is fitted on with a ground joint to prevent leakage. In the chamber there is also a metal partition extending from the inner circumference to the shaft, where another packing of leather makes a tight joint. In the partition is a small opening controlled by a needle valve, adjustable from the outside. Another passage, much larger, runs through the chamber casting from one side of the partition to the other at the top, forming a bypass, and in it is a check valve which permits the flow of liquid in one direction only.

An arm is attached to the outer end of

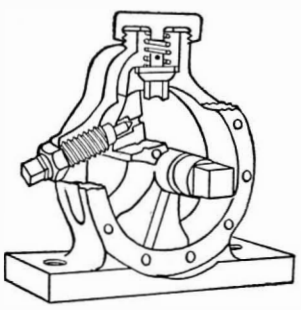

Fig. 7.—Hotchkin Shock Absorber With Cover Removed and Section Broken Away to Show Check-valve and By-Pass.

the shaft carrying the radial piston, and to this arm is pivoted a link; the chamber with its piston is bolted to the car spring, while the upper end of the link is attached to the frame above. Any movement of the spring is of course communicated to the link and thence to the arm, the shaft, and the piston. In order to move the piston, however, the glycerine in the case must be displaced, as it is confined in the two spaces formed by the piston and the partition, the only communication being through the small valve-controlled hole and the larger bypass. On the downward movement of the car body the glycerine is permitted to pass freely through the check valve in the bypass, and the opening is of such size that there is little or no retarding effect. On the upward movement, however, the check valve closes, and there is left only the small hole in the partition. Through this the glycerine is forced comparatively slowly, and the speed of the spring rebound is retarded to conform to the rate at which the glycerine can pass the orifice. Obviously, the smaller the hole the slower the movement; and as the opening can be regulated by the needle valve referred to, the speed of action permitted can be adjusted to a nicety.

If desired, the chamber can be attached to the car frame and the link to the spring; the attachments furnished permit either arrangement, and the device works equally well either way. The glycerine acts as a lubricant and is non-freezing.

Spring action and friction are combined in the Baldwin spring recoil check, made by the Baldwin Chain and Manufacturing Company, of Worcester, Mass. This is shown in Figs. 8 and 9. From the body or frame of the car is suspended a cylinder, *A*, open end down, by two rods depending from a pivoted yoke, *H*, and carrying compound springs, *F*, *G*. In the middle cylinder is a plunger

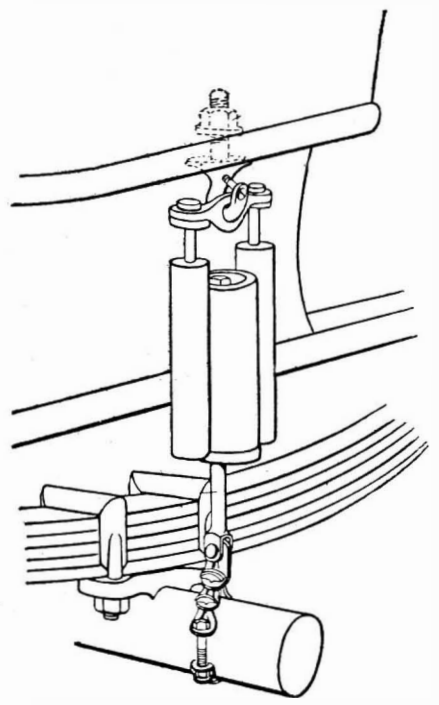

Fig. 8.—The Baldwin Combined Spring and Friction Recoil Check.

B, divided vertically into halves and faced with cork on its bearing surfaces. Rod *E* has a slotted head engaging the inner ends of two small toggle arms whose outer ends bear on the two halves of the plunger, so that a downward pull on the rod tends to force apart the two halves and bring them into more or less forcible contact with the cylinder walls, while the upward movement of the rod withdraws the plunger from contact with the cylinder walls. The action of the toggles is modified by small helical springs, so that a rapid, sudden pull of the rod will cause the plunger to exert a greater pressure against the cylinder walls and a consequent slower movement. Within each of the smaller cylin-

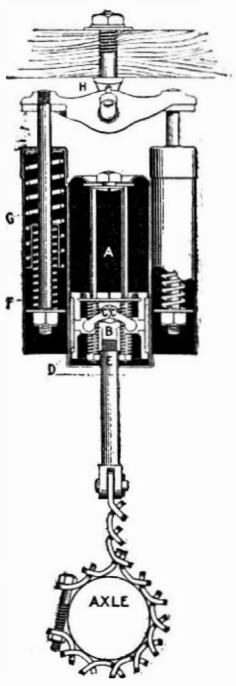

Fig. 9.—View Showing the Combined Spring Recoil and Friction Check Partly in Section.

ders are a pair of coiled springs, *F* and *G*, one of these springs being lighter than the other. With an up-and-down movement of about 4 inches, the rebound is checked by these springs. Should, however, a much greater movement of the frame with respect to the axle occur, the piston, *B*, will travel upward in the cylinder, *A*, while the frame is approaching the axle, but will immediately lock, and then travel slowly downward as soon as the rebound begins.

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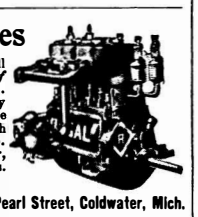

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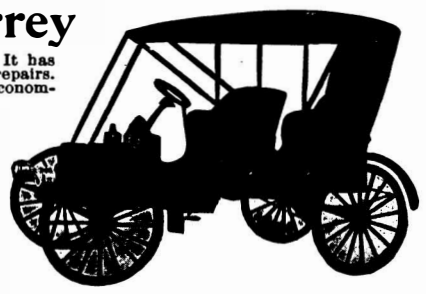

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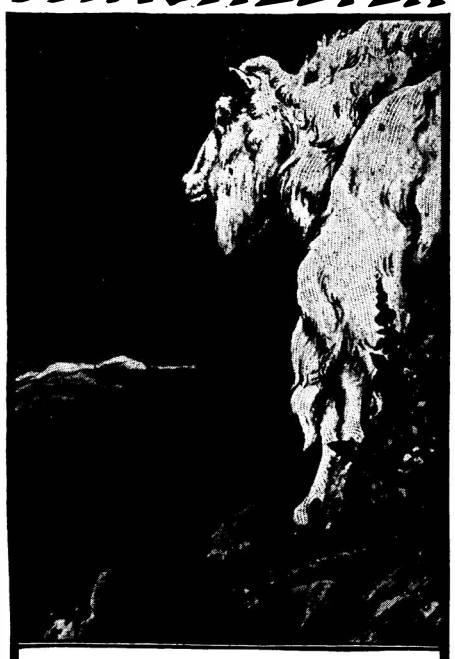

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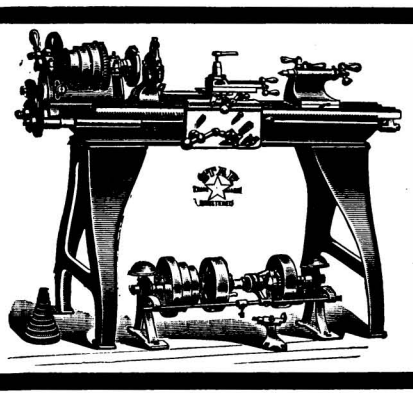

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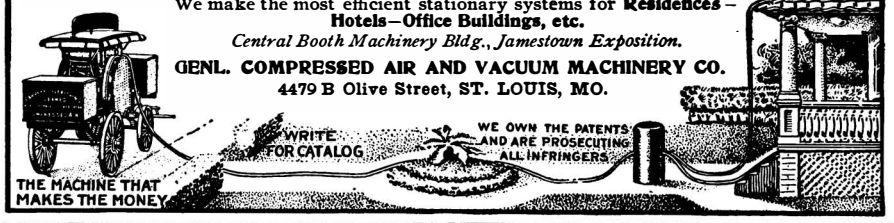

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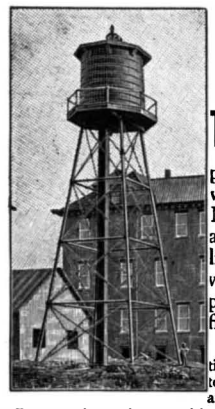

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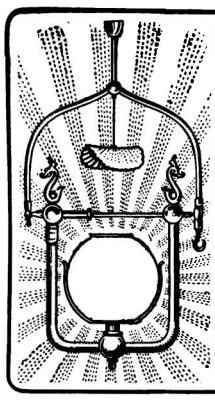

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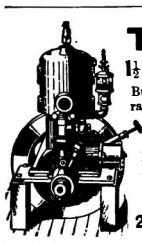

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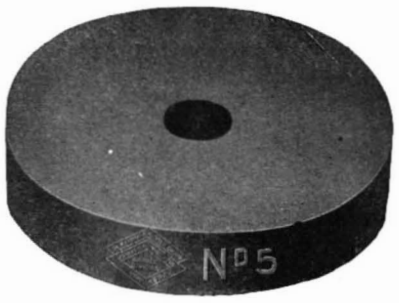

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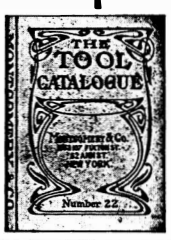

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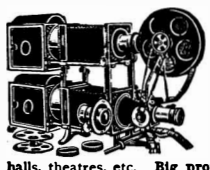

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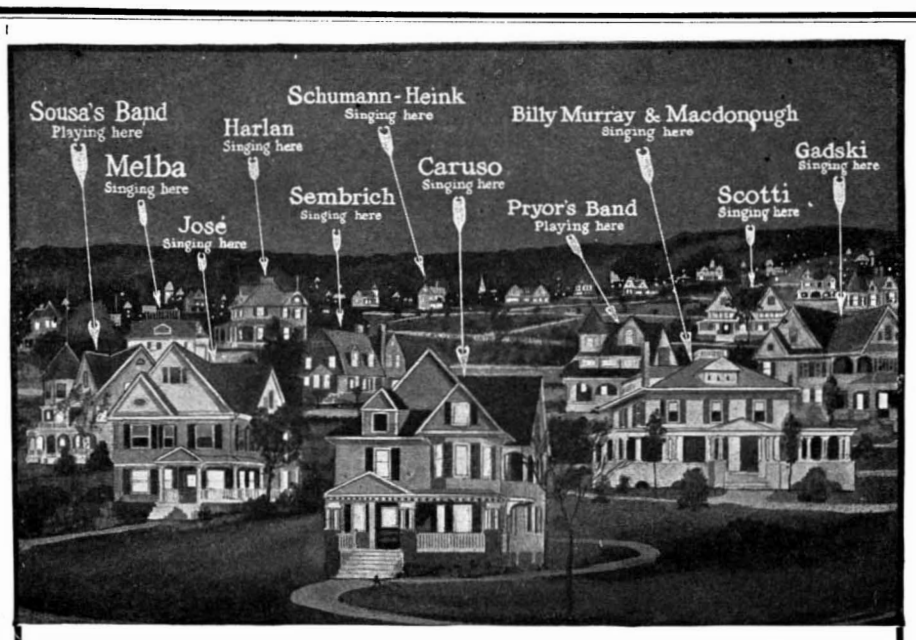

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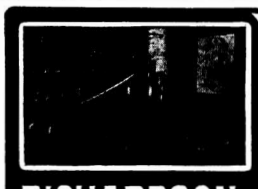

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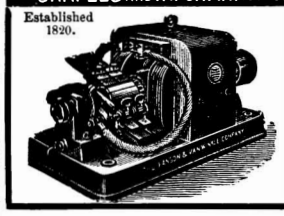

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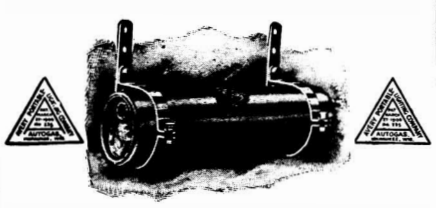

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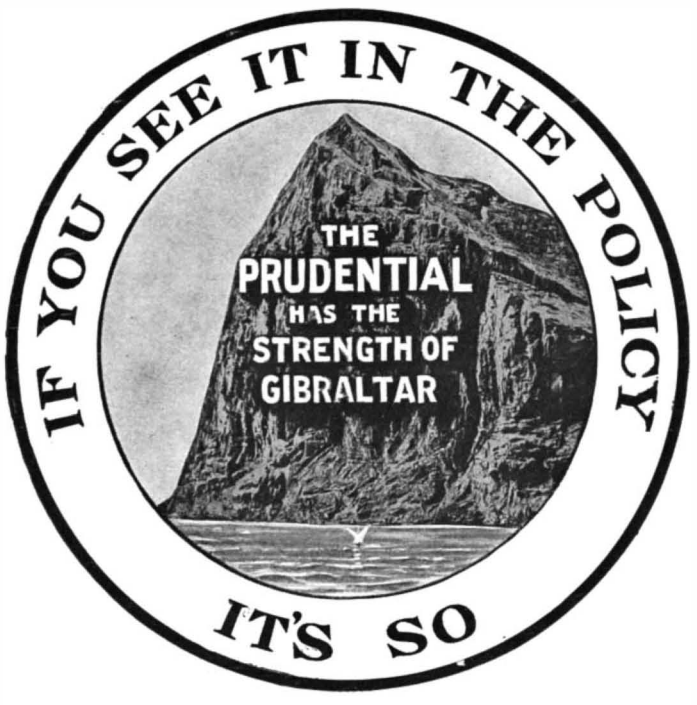

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